ROADS AND STREETS

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TEST PAVEMENT,
CHRYSLER TANK ARSENAL

In This Issue: Ready-Mix Runway Job . . . Alaska Highway Bridges . . . 1944 Maintenance Outlook . . . More Research Board Summaries . . . Ohio Access Roads . . . N. Dakota's Road Magnet . . . Kudzu for Erosion Control . . . With Army Engineers in Pacific . . . Earthmoving Safety Hints . . . Wartime Bridge Deck Widening . . . Engine Shipping Crates . . . Navy Equipment Renovation . . . How to Use Applicator Bars . . . Overhaul of Power Mowers. Front-End Shovels . . . Repairing Loadometers.

R v.87 1944

LET'S HAVE A JOB FOR HIM

WHEN HE COMES HOME

—through Post-War Planning *NOW!*

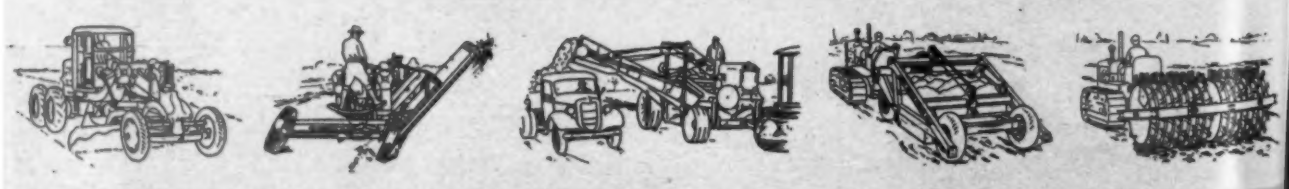
● While the war is far from being won—yet—the day is coming when millions of uniformed boys will be returning and they will need jobs. The thousands of highway and street improvement projects held up for two years and so badly needed can provide those jobs immediately at the close of the war *if* every state, county, and city administration will bring these projects up to the specification and blue print stage *now.*

Whether you are highway official or contractor, your post-war planning will not be complete without consideration of the many ways in which Adams equipment can be adapted profitably to your work. Your local Adams distributor will be glad to talk this over with you at any time.

J. D. ADAMS COMPANY, INDIANAPOLIS, IND.

Sales and Service Throughout the World

ADAMS ROAD-BUILDING AND EARTH-MOVING EQUIPMENT



Tech.

Serving with the Seabees ★

The Seabees—those tough and able men who carve airfields out of tropical islands, set up bridgeheads while enemy bombers drone overhead, and move equipment across rivers and canyons amid whining bullets—are among the foremost users of Bethlehem Wire Rope.

The Seabees are using Bethlehem Wire Rope on power shovels, cranes, hoists, dredges and on the many other pieces of equipment used in military construction. Hundreds of tons, millions of feet, of Bethlehem Wire Rope are going into ships' rigging, truck-winch cables, towing hawsers, Navy-yard dredges, mines, oil fields and war-plants. We are doing our best to produce more rope, better rope, faster.

BUY MORE WAR BONDS

★ ★ BETHLEHEM STEEL ★ ★ **BETHLEHEM WIRE ROPE**

ROADS AND STREETS

Vol. 87, No. 1 • January, 1944

ECA

A magazine devoted to the design, construction, maintenance and operation of highways, streets, bridges, bridge foundations and grade separations; and to the construction and maintenance of airports.

WITH ROADS AND STREETS HAVE BEEN COMBINED GOOD ROADS MAGAZINE AND ENGINEERING & CONTRACTING

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THIS MONTH'S COVER

"Scene during tank testing operations at the Chrysler tank arsenal, Detroit. This mile-long rectangular track was recently reconstructed with heavy-duty two-course asphalt concrete. The tread marks in the pavement incidentally are 'eraser' marks from rubber treads and not surface depressions. A detailed article describing this type of test road pavement at a Detroit arsenal will appear in a forthcoming issue of ROADS AND STREETS."

The Whole World IS THEIR PROVING GROUND

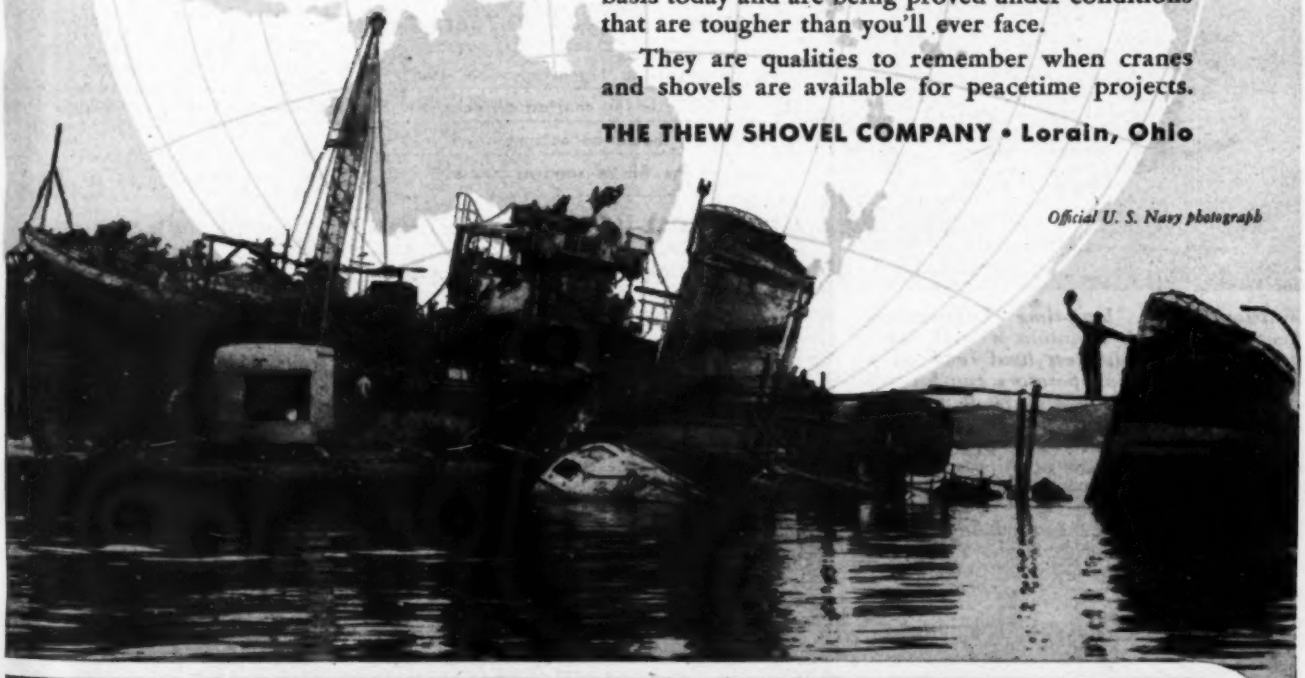
IN this war, American equipment, like the American soldier, is seeing strange places and facing unusual jobs. In the humid heat of the South Pacific—in the cold and rock of the North Pacific—in the sand and heat of Africa—and in many other climates and parts of the world, Lorains are being tested as never before.

Take the case of this Lorain Crane that is salvaging a Jap destroyer. It may seem a far cry from salvaging ships in the South Pacific to erecting steel on Main Street, U. S. A., but the requirements of a good crane are the same anywhere.

Extra strength, power and speed are qualities that have always been built into Lorains. They are qualities that are being tested on a world-wide basis today and are being proved under conditions that are tougher than you'll ever face.

They are qualities to remember when cranes and shovels are available for peacetime projects.

THE THEW SHOVEL COMPANY • Lorain, Ohio



Official U. S. Navy photograph

thew Lorain CRANES

SHOVELS • DRAGLINES • MOTO-CRANES

TO MAKE SURE YOU'RE OPERATING YOUR CARRYALL SCRAPERS AT TOP EFFICIENCY

Check Your Operations

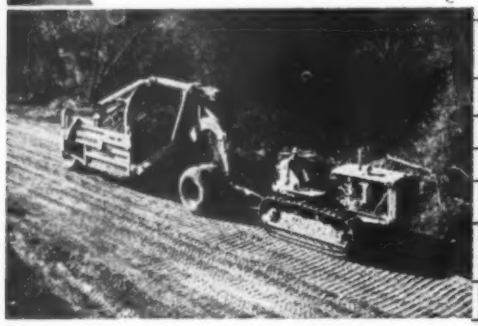
WITH THIS HANDY LeTOURNEAU CHECK-LIST*

It's planned to cover your complete earthmoving cycle, shows you what to look for at every operating step

If you're not getting the yardage from your tractor-scraper rigs that you think you should, use this simple LeTourneau Carryall Check-List. It will quickly show you where the job is falling down and what to do to correct the situation.

Ask for Earthmoving Estimator

This handy LeTourneau Estimator will give you yardage figures and other pertinent data for specific hauls and grades. Use it to supplement Check-List given here. Copy free for the asking.



Winston Bros., long-time LeTourneau fleet users, here maintain a well compacted, smooth, dustless haul road on a West Coast job, so operators can hit top speed quickly and maintain it without time-consuming gear shifts. "Caterpillar" D8 Pusher enables Model W Carryall (23 heaped yards) to load in minute or less.

(Below) List & Clark spread and get off the fill in a hurry with Model LP Carryall (15 heaped yards) and "Caterpillar" D7 Tractor.

LOADING . . . *Check These Points*

1. Carryall Scrapers should carry heaping loads.
2. Loads should be obtained in 100 feet or less.
3. In average conditions, heaping loads should be obtained in 1 minute or less (for Carryalls over 15 heaped yards pusher or snatch generally required).
4. If more than 100 feet or 1 minute is required to load, then . . .
5. Material may be too hard and should be broken with a Rooter, or . . .
6. Blade may be cutting too deep, causing tractor motor to slow down, or . . .
7. Cut may be too light, not making full use of tractor power.
8. *Always* establish down-hill loading. It's rarely ever impossible.

HAULING . . . *Check These Points*

1. Tractor should average 4.0 m.p.h. travel speed in normal conditions.
2. Use highest gear utilizing full r.p.m.
3. No more than ¼ minute is necessary for each turn.
4. Use shortest travel routes.
5. Maintain smooth roadways for fast travel.

SPREADING . . . *Check These Points*

1. Spread loads in highest possible gear.
2. Unload dirt in the shortest distance possible, according to depth of spread.
3. Spreading should be accomplished in .5 of a minute or less.
4. Get off the fill as soon as possible.

MECHANICAL—*(Check with LeTourneau Maintenance Manuals)*

1. Check all adjustments on Carryall Scraper and Power Control Unit.
2. Carryall blade should be installed properly to keep sharp.
3. Cable must run free on sheave wheels without binding.
4. Lubricate sheave bearings every 8 hours. (See LeTourneau Lubrication Chart)
5. Check all moving parts for free movement.
6. Check tire pressures for job conditions. (See LeTourneau Tire Chart)

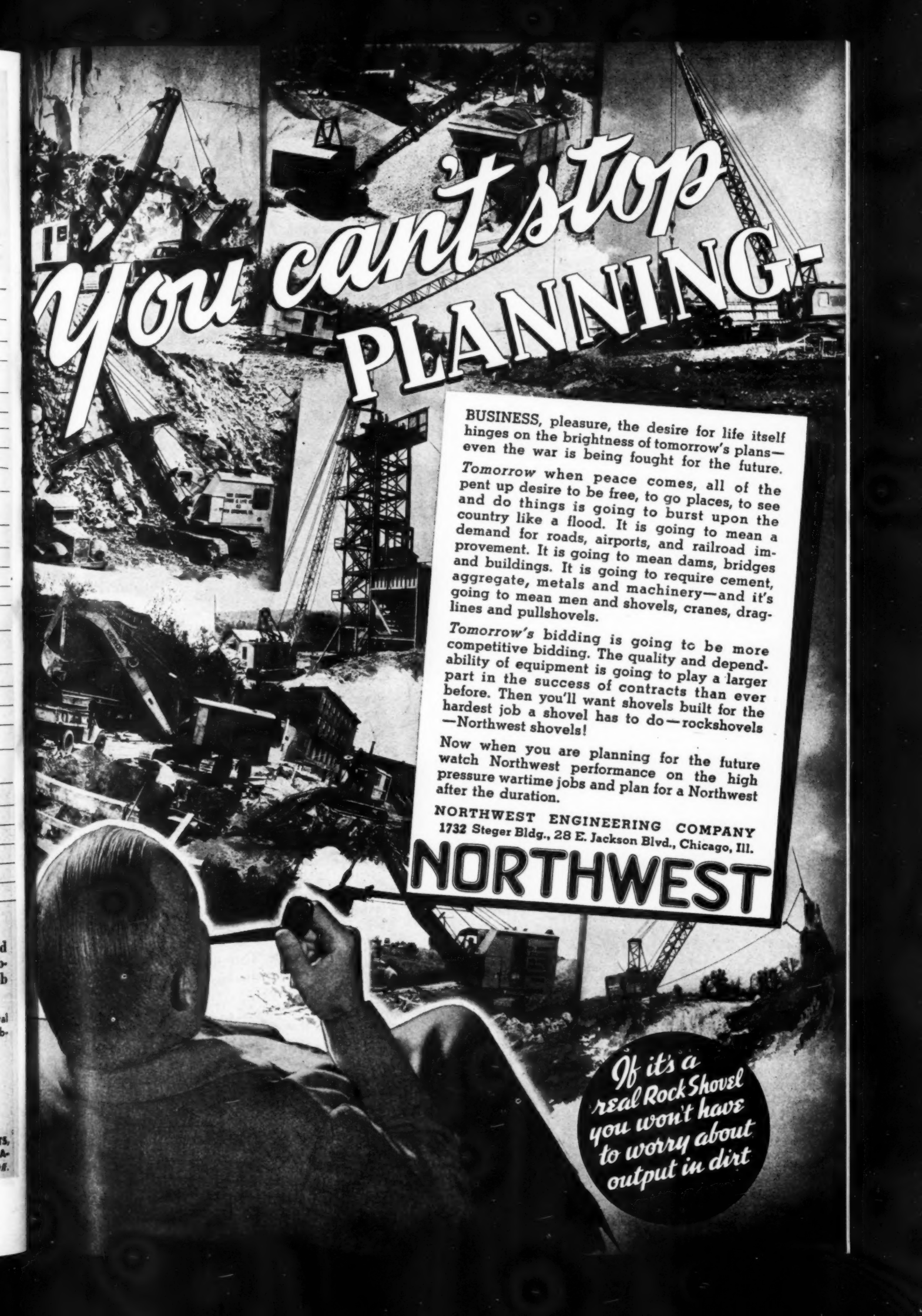
CHECK WITH YOUR DEALER—If your check-up shows a need for repairs or parts, call your LeTourneau-"Caterpillar" distributor—he's completely equipped to handle your repair job quickly, thus reduce costly downtime. Check with him NOW.

* Prepared by the LeTourneau Field Engineering Dept. from field observation of several million yards of earthmoving at home or abroad. If you have special earthmoving problems please feel free to call on this Department.

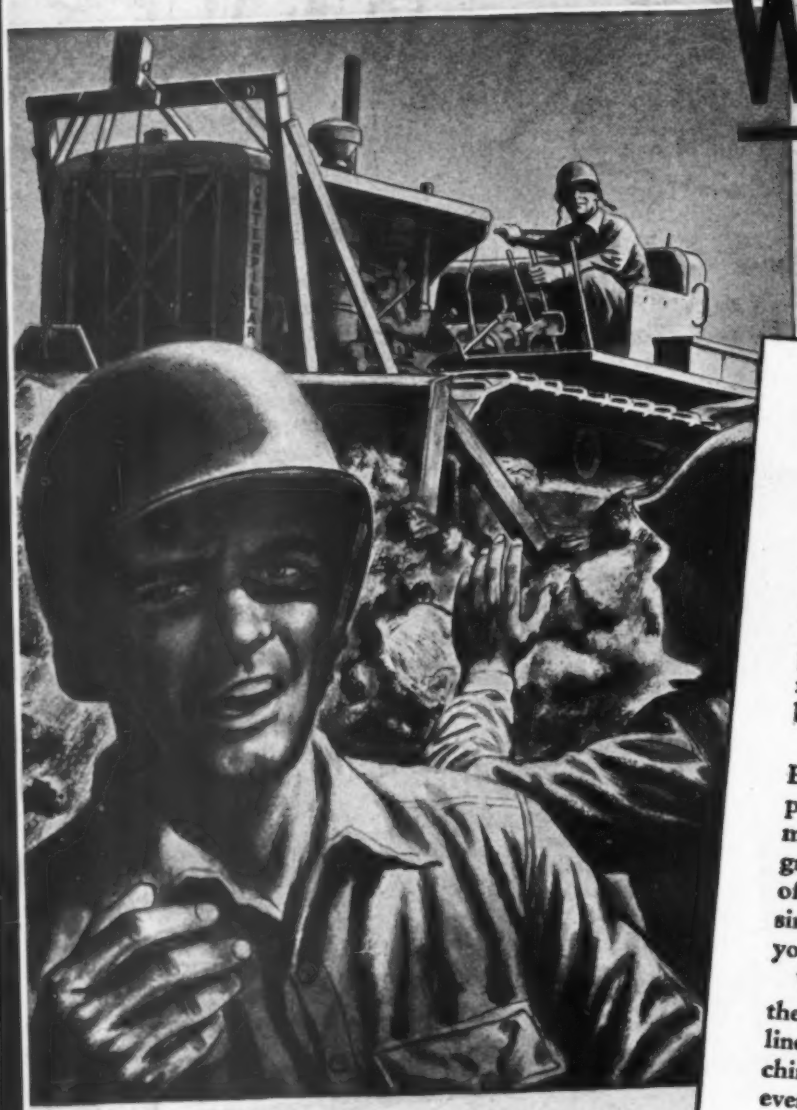
LETOURNEAU

PEORIA, ILLINOIS • STOCKTON, CALIFORNIA

Manufacturers of DOZERS, CARRYALL* SCRAPERS, POWER CONTROL UNITS, ROOTERS*, SHEEP'S FOOT ROLLERS, TOURNAPULLS*, TOURNAROPE*, TOURNA-TRAILERS*, TOURNAWELD*, TOURNACRANES*. **Trade Mark Reg. U. S. Pat. Off.*


You can't stop
PLANNING-
BUSINESS, pleasure, the desire for life itself hinges on the brightness of tomorrow's plans—even the war is being fought for the future.
Tomorrow when peace comes, all of the pent up desire to be free, to go places, to see and do things is going to burst upon the country like a flood. It is going to mean a demand for roads, airports, and railroad improvement. It is going to mean dams, bridges and buildings. It is going to require cement, aggregate, metals and machinery—and it's going to mean men and shovels, cranes, draglines and pullshovels.
Tomorrow's bidding is going to be more competitive bidding. The quality and dependability of equipment is going to play a larger part in the success of contracts than ever before. Then you'll want shovels built for the hardest job a shovel has to do—rockshovels—Northwest shovels!
Now when you are planning for the future watch Northwest performance on the high pressure wartime jobs and plan for a Northwest after the duration.
NORTHWEST ENGINEERING COMPANY
1732 Steger Bldg., 28 E. Jackson Blvd., Chicago, Ill.
NORTHWEST
If it's a real Rock Shovel you won't have to worry about output in dirt

"CATERPILLAR" DIESELS ARE WORTH WAITING FOR!



THE FIGHTING FOUR

INSPECT Look your equipment over frequently. For expert "internal" inspection of operating parts or functions, call in a trained "Caterpillar" service man. Read your Operator's Instruction Book.

LUBRICATE Use the right oil at the right time in the right place and in the right quantity. Keep the oil clean —change before it becomes dirty and deteriorated. Follow the Operator's Instruction Book.

ADJUST Tighten all bolts. Keep fan belt and tracks at proper tension. Read the Operator's Instruction Book. For fuel injection valves and other precision adjustments, let your experienced service-dealer do the work. He'll do it well.

REPLACE Have your service-dealer replace or repair worn bearings, track rollers, pins and bushings, sprockets, cylinder liners, clutch linings. His service helps restore power and extend equipment life. Saves critical materials, too.

RIGHT NOW, "Caterpillar" production is bigger than it ever was in peacetime. But when the Armed Forces have taken the machines they need so much and use so well, there are nowhere near enough left to meet the world-wide demand. The War Production Board is allocating the available balance as fairly as possible among civilians whose work is essential to the war effort. Thousands of other prospective purchasers are asked to wait for their new "Caterpillar" Diesel equipment—but it will be *worth waiting for.*

"Caterpillar" Diesel Tractors, Motor Graders, Engines and Electric Sets have been good in the past. They will be better in the future. No "dream machines," but *proved* on the toughest testing-grounds the world has ever seen—the battle fronts of this war. They'll have the same ruggedness and simplicity, the same economy and dependability you have always known and liked.

When victory comes, you won't have to wait while the factory reconverts. "Caterpillar" production lines will keep right on rolling them out, and machines will be obtainable in larger numbers than ever because of our vastly expanded output.

You'll buy your new "Caterpillar" Diesels from the same trusted dealer who knows your problems.

With his help in servicing and maintaining your old machines, you can afford to wait for the equipment that is your first choice.

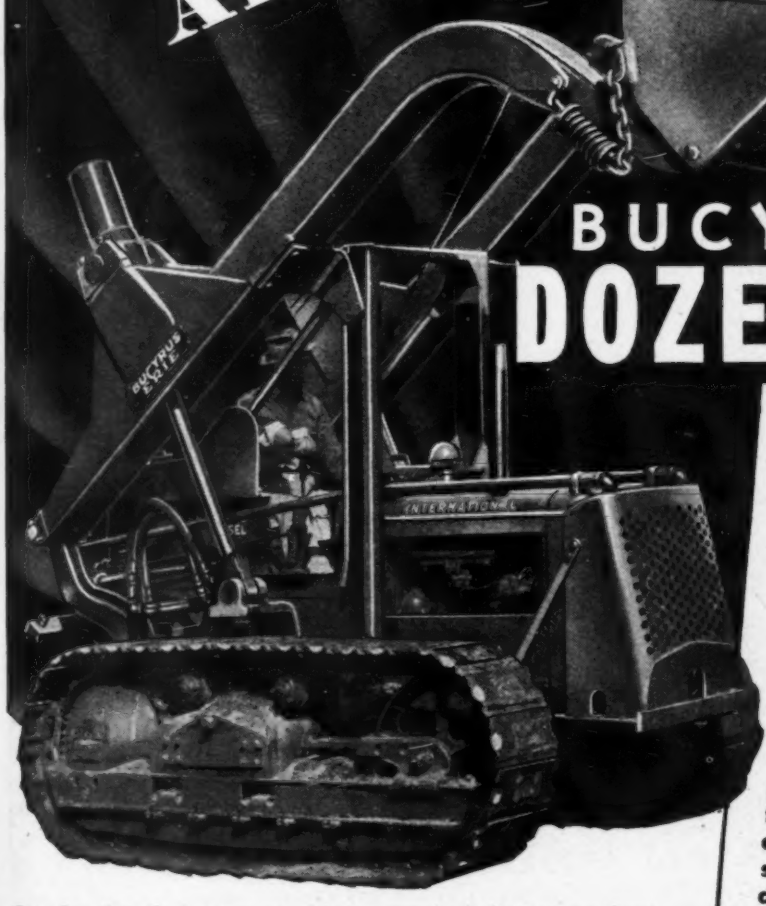
CATERPILLAR TRACTOR CO. • PEORIA, ILLINOIS

CATERPILLAR
REG. U.S. PAT. OFF.
DIESEL

TO WIN THE WAR: WORK—FIGHT—BUY U. S. WAR BONDS!

Announcing the NEW

BUCYRUS·ERIE DOZERSHOVEL



Here's a *new* tractor equipment unit — the completely different DOZERSHOVEL for T9 and TD9 International TracTracTors. Built for the armed forces and thoroughly tested in tough military service, the Dozershovel is now available in limited numbers for civilian use under proper government release.

The Dozershovel gives you full-fledged tractor shovel and bulldozer service through unique design. Simple interchangeability permits in-the-field changeovers in just a few minutes. You get easy penetration, even in hard materials, through hydraulic control and positive down pressure on bucket or blade. Strong side arms make lifting big loads easy, dozing sure and smooth. Other features are unobstructed visibility, oscillating tracks, and low overhead clearance. Lifting crane service is made possible by a hook on the upper edge of the bucket or blade.

Get the detailed story on this economical dirt mover from your International TracTracTor distributor. The Dozershovel is a new gateway to greater profits.

● POWERFUL DIGGING AND DOZING

Not just another front-end shovel, the Dozershovel is both shovel and dozer. It easily digs and lifts heaping buckets, dozes full blades and level cuts. Hydraulic control and down pressure up to 4200 pounds give real "bites," even in tough materials.

● UNOBSTRUCTED VISIBILITY

No blind spots, no "guessing the load" with the Dozershovel. Its full visibility permits the operator to load full buckets quickly, to dump accurately, to doze a level surface. This feature is important in reducing operator fatigue, too.

● INTERCHANGEABILITY

It takes only a few minutes to change over in the field from shovel to dozer. Just remove five pins holding the bucket, trip latch, and limit chains; set blade in place; replace pins, and the job is done. The bucket trip mechanism is a big help in dozing, too, for it permits tipping the blade forward to free the blade of its load on uphill work.

BUCYRUS ERIE TRACTOR EQUIPMENT

INTERNATIONAL TRACTRACTOR

SWIFTER ROADS TO ALL FRONTS

Top, B-G Finisher constructing highway near airport in Egypt. Bottom, B-G Army Asphalt Plant in central plant set-up.

Mobility, America's secret weapon, is winning the war on all fronts. First demonstrated at the Battle of the Marne, World War I, when Paris garrison troops were moved by taxicabs to turn the German army.

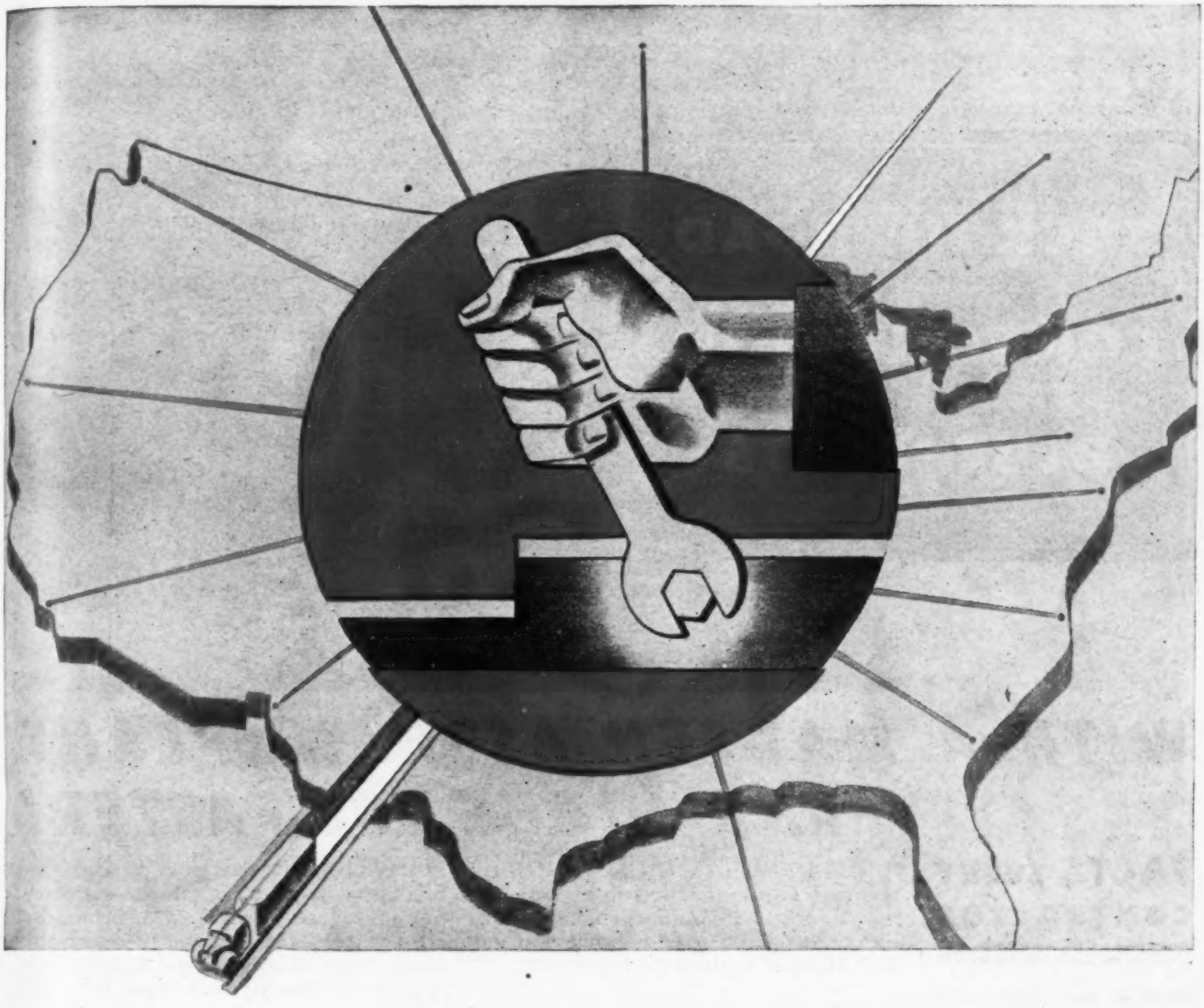
Today, Allied motor convoys miles long travel hundreds of miles in a few days—a constantly shifting, hard-hitting force. The German Panzer units of Blitz fame are being out-blitzed on swiftly constructed highways and runways!

The U. S. Army Engineers who make these movements possible use modern construction equipment to build their roads, landing strips and bomber bases right up to the front lines. The same type of equipment that will provide a vast network of roads and airports after the war for civilian mobility—for business and pleasure. 44-1

ARMY E NAVY

BARBER-GREENE

AURORA, ILL.



You get service and supply from PIONEER DISTRIBUTORS

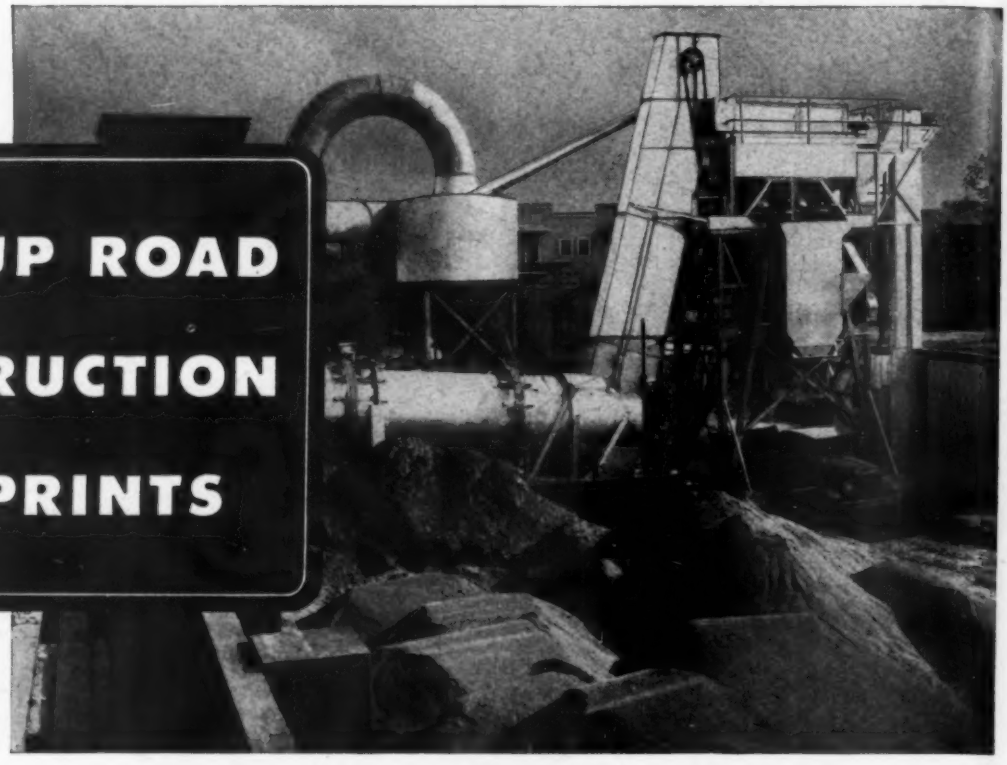
● Strategically located to best serve the needs of producing areas, each Pioneer Distributor is a depot of service and supply, staffed, equipped and immediately available to put equipment back into action—to keep an operation going. Each Pioneer Distributor is prepared to help you.

Emergencies demand action. Delays are costly. From the shops of Equipment Distributors, from their stocks, their manpower and their field representatives come important and vital services. Only with distributors could the economies and efficiencies that prevail in our basic construction industries have been developed to their present high degree.

Pioneer presents its distributors as an invaluable source of essential maintenance, repair and parts. Pioneer Distributors are well able to serve with ideas and suggestions on new equipment which may be available. Look to your Pioneer Distributor to keep your equipment equal to all requirements.

Pioneer
ENGINEERING WORKS
Crushers · Screens · Conveyors · Feeders and Portable Plants
MINNEAPOLIS 13, MINNESOTA

ENGINEERS and MANUFACTURERS of QUARRY · GRAVEL AND MINING MACHINERY



BACK UP ROAD CONSTRUCTION BLUEPRINTS

WITH A MADSEN ASPHALT PLANT —AND DO THE JOB FASTER!

FACTS EVERY CONTRACTOR SHOULD KNOW

Madsen has 29 years of experience in designing and constructing asphalt plants.

The Madsen line of asphalt equipment is the most complete offered by any manufacturer.

Madsen pioneered many of the major developments in asphalt plant equipment.

Only Madsen plants can offer the four following features:

THE ETERNAL CHALLENGE to black top construction engineers, contractors, and equipment manufacturers is *speed*—and *speed* is what you get with Madsen Asphalt Paving Plants.

Owners and operators report:

"It is not unusual to mix in excess of 200 tons per hour with our 3000-lb. Madsen Plant."

"We produced 149,121 tons in 8 months with our 3000-lb. Madsen Plant."

"We mixed 75,920 tons from October 1 to December 8 with our 3000-lb. Madsen Plant."

"33,000 tons of asphaltic concrete was mixed by our Madsen Plant in 26 eight-hour days."

Madsen Plants offer synchronized plant operations accelerated to the faster mixing of the high speed Madsen pug mill mixer. Seconds are saved by asphalt pressure-injection—a Madsen patented exclusive feature. Additional time is saved in the mixing operation because the asphalt is quickly incorporated in the whirling aggregates. Only 4 to 6 seconds by stop watch are required to dump the batch. These seconds saved actually produce 25 to 40 more batches per 8-hr. day

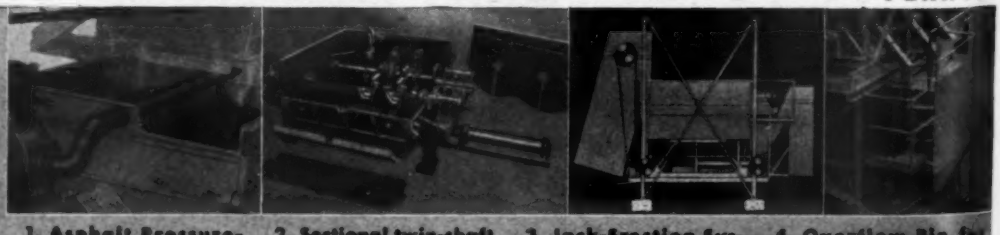
Madsen Plants are *completely* self-erecting. No ramps, skids, cranes, or extra equipment are required with the Madsen patented jack-erection system. That's why Madsen Plants are easier to erect and easier to dismantle and move.

Six sizes of asphalt plants, four sizes of oil-mix plants and the famous Road Pug travel-mix machine make up the Madsen line of bituminous equipment. For your future plans, write for catalog MP-120.

MADSEN IRON WORKS
HUNTINGTON PARK, CALIFORNIA

4 REASONS FOR THE SUPERIORITY OF MADSEN ASPHALT PAVING PLANTS

4 EXCLUSIVE FEATURES ON EVERY MADSEN ASPHALT PLANT



1. Asphalt Pressure-Injection System
2. Sectional twin-shaft Pug Mill Mixer
3. Jack-Erection System and power lift
4. Overflow Bin for easy truck loading

READY FOR MORE SERVICE STRIPES

It's ready again! After thousands of hours of tough service, this Allis-Chalmers Model WM tractor is ready for more service stripes . . . ready to take what comes for additional years. Owned by contractor H. L. Coble, Greensboro, North Carolina, it returns with stepped-up efficiency to its work on a nearby Army Air Base.

The overhaul included repairing of the final drive, installation of new track rollers and adjustments on right hand track. Yet the job took only three days—which included a one day wait for certain critical parts . . . fast service, considering present conditions and the shortage of vital materials and labor. But E. F. Craven Company, Greensboro, N. C., who handled the job, like other Allis-Chalmers dealers, is equipped to render good service in these difficult times.

Why not get new machine performance by rebuilding *your* worn equipment! Entrust the job to your Allis-Chalmers dealer and rest assured the work will be handled right and with all possible speed. At all times he has done his best to serve you . . . even under wartime conditions he is doing a *mighty fine job.* See him . . . today!

MEN WHO KNOW "what's what" *about machines handle your repairs in Allis-Chalmers shops. Here, two of E. F. Craven's crew apply their skill on overhauling the final drive of the Model WM owned by contractor H. L. Coble, Greensboro, North Carolina.*

ALLIS-CHALMERS
TRACTOR DIVISION • MILWAUKEE • U. S. A.

When Roads

IN 48,000 communities snow is more than an inconvenience — it's a downright menace to the profit and comfort of the community. Over forty-eight thousand communities are entirely or almost entirely dependent on motor traffic for their supplies.

When the highways jam with drifts, business all but comes to a standstill.

The business of the community and the part the roads play in improving business should be of prime importance to every highway department and county commission.

The winter business of normally winter-bound communities should be better than summer business, for farmers have time to get to town.

Proper snow removal equipment—Snogo can keep the highways—the arteries of business—open.

Snogo throws the snow *off* the road. No banks build up in ever deepening, narrowing lanes that delay traffic and endanger lives. Workers get to their jobs, children get to school—and back—roads are open for the fire department and the doctor, and winter business goes on better than usual.

More than ever before the highway official should plan to give his community the assurance of better winter snow clearance.

Many counties and state departments are not getting the winter advantages for better winter traffic conditions that Snogo can give them. Check into what Snogo is doing in other communities.

Let us send you details to help your future plans.

KLAUER MANUFACTURING COMPANY • DUBUQUE, IOWA

are like this

there's no business here-
Nor here-
nor here-
nor here-

KEEP
'em Rolling

SNOGO

A SNOGO For
EVERY BUDGET

What Counts Now IS THE PROPER CARE OF YOUR TRUCKS

BEHIND every International Truck on the job today is a sizeable investment in International SERVICE. It's SERVICE that catches little troubles before they become big ones. It's SERVICE that puts the *ready to roll* O.K. on your trucks and guards your home front operations.

International dealers and branches are doing their wartime best to help you prolong the life of your trucks. They take their service obligations seriously. They are set up to do a thorough, over-all job. Their investment in skilled servicemen, special tools and equipment, and Genuine International Truck Parts is your assurance that they are putting PROPER CARE of your trucks in first place.

Arrange with the nearest dealer or branch for a program of SCHEDULED TRUCK SERVICE this coming winter.

INTERNATIONAL HARVESTER COMPANY
180 North Michigan Avenue Chicago 1, Illinois

★ ★ ★ ★ *Buy War Bonds...Save and Serve America* ★ ★ ★ ★

INTERNATIONAL TRUCKS

CABLE control ...at its best!

Easy-to-reach controls. High leverage.
External clutches and brakes are big, cool running, smooth acting.
Two decks for mounting fairlead swivel sheaves for better performance on different classes of work.
Sheaves slue in excess of 180°.

WITH BUCKEYE CABLE CONTROL, YOUR TRACTORS CAN DO MORE JOBS!

BUCKEYE Power Control Units are fast—a touch of the control and the line sings into action. They take hold of the load smoothly and evenly with no jerks, and the sheaves are designed to minimize cable wear—you can use smaller, less expensive cable than with other winches having comparable line pulls. Big clutch and braking area plus external location means cool operation and long life. Center of line pull is low to maintain tractor balance and better traction. Controls are high leverage, within easy reach. You have your choice of Heavy Duty or Medium Duty, single or double, wide or standard drum, models. For all makes and models of tractors. Specification data on request.

Check Ad Page 71

BUCKEYE TRACTION DITCHER CO.
Findlay, Ohio

Convertible Shovels
Spreaders
Power Finegraders

Buckeye

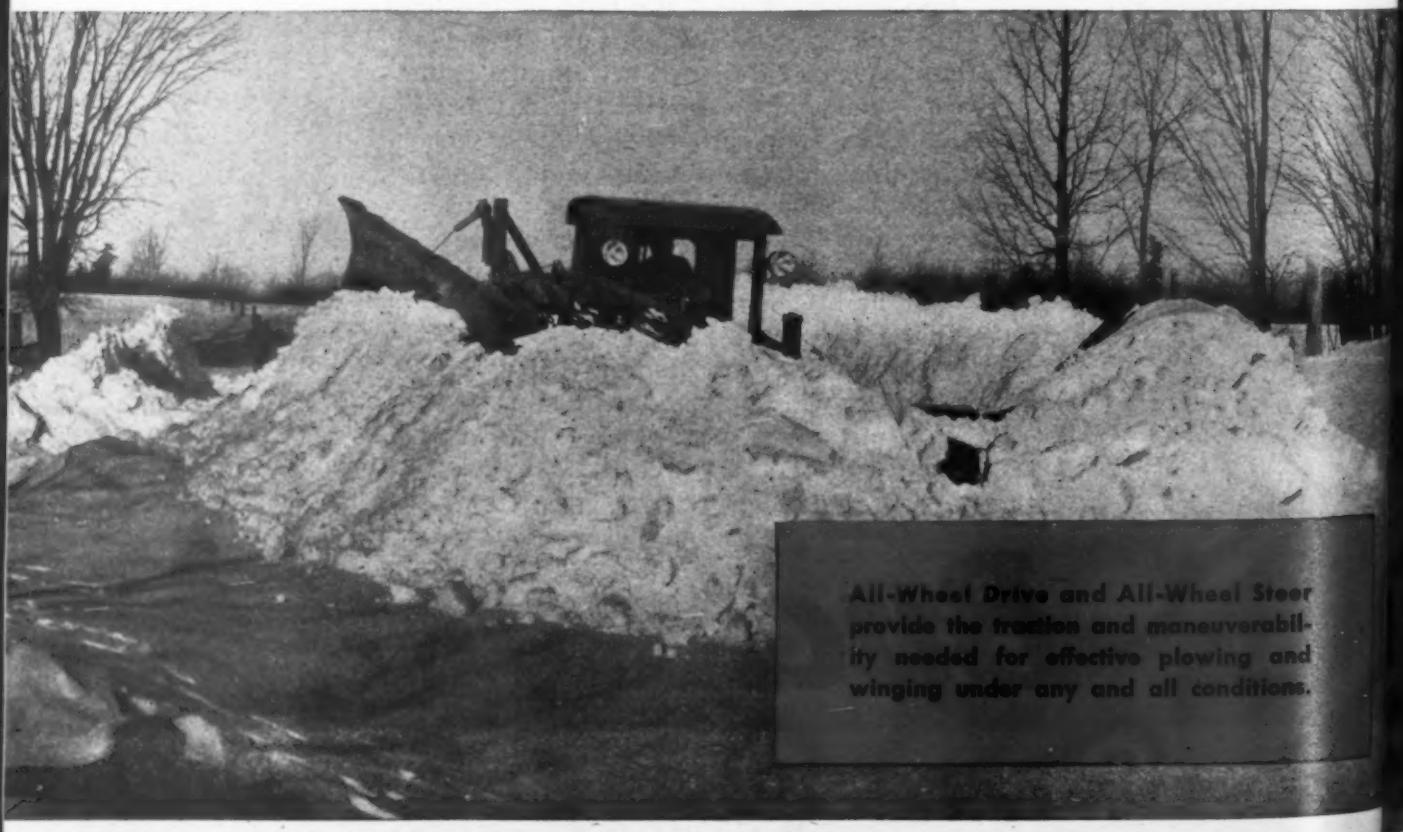
Trenchers
Tractor Equipment
Road Wideners

THERE'S EXTRA PERFORMANCE IN EVERY ATTACHMENT with

All-Wheel Drive and All-Wheel Steer make it possible to mount an attachment ahead of or behind the "99-M" without sacrifice of operating efficiency or machine control. When the entire weight of the rear end of the machine is transferred to such a rear-mounted attachment as the Roller, the "99-M" drives and steers with its front end. When the entire weight of the front end is transferred to such a front-mounted attachment as the Bulldozer, the "99-M" drives and steers with its rear end. An ordinary motor grader would be helpless under such conditions.

In addition to making it possible to mount on the "99-M" attachments that could not be mounted on ordinary motor graders, All-Wheel Drive and All-Wheel Steer provide traction and maneuverability that make every attachment just that much more effective on the "99-M" than it would be on other motor graders.

THE AUSTIN-WESTERN ROAD MACHINERY CO., AURORA, ILLINOIS, U. S. A.



All-Wheel Drive and All-Wheel Steer provide the traction and maneuverability needed for effective plowing and winging under any and all conditions.

ALL-WHEEL *Drive* ALL-WHEEL *Steer*

↑ Bulldozing over the edge of a fill. All-Wheel Drive provides maximum traction; All-Wheel Steer provides exceptional maneuverability.

ighway departments find the Loader unequalled ditch and shoulder maintenance. Contractors d many uses for the Loader on work involving llow excavation. ↑

rifying tough blacktop. The alloy tooth points → removable; the tooth shanks are adjustable. block folds up to give unusual throat room.

Roller has many uses on construction and re-struction work, and on many materials, includ-gravel, blacktop and soil cement. ↓

BUILDERS OF ROAD MACHINERY

Austin Western

SINCE 1859

BUY MORE WAR BONDS

The Austin-Western line includes POWER GRADERS, ROAD GRADERS, ELEVATING GRADERS, ROAD ROLLERS, SHOVELS AND CRANES, STREET SWEEPERS, DUMP CARS, TRAIL CARS AND A COMPLETE LINE OF ROCK CRUSHING AND SCREENING PLANTS.

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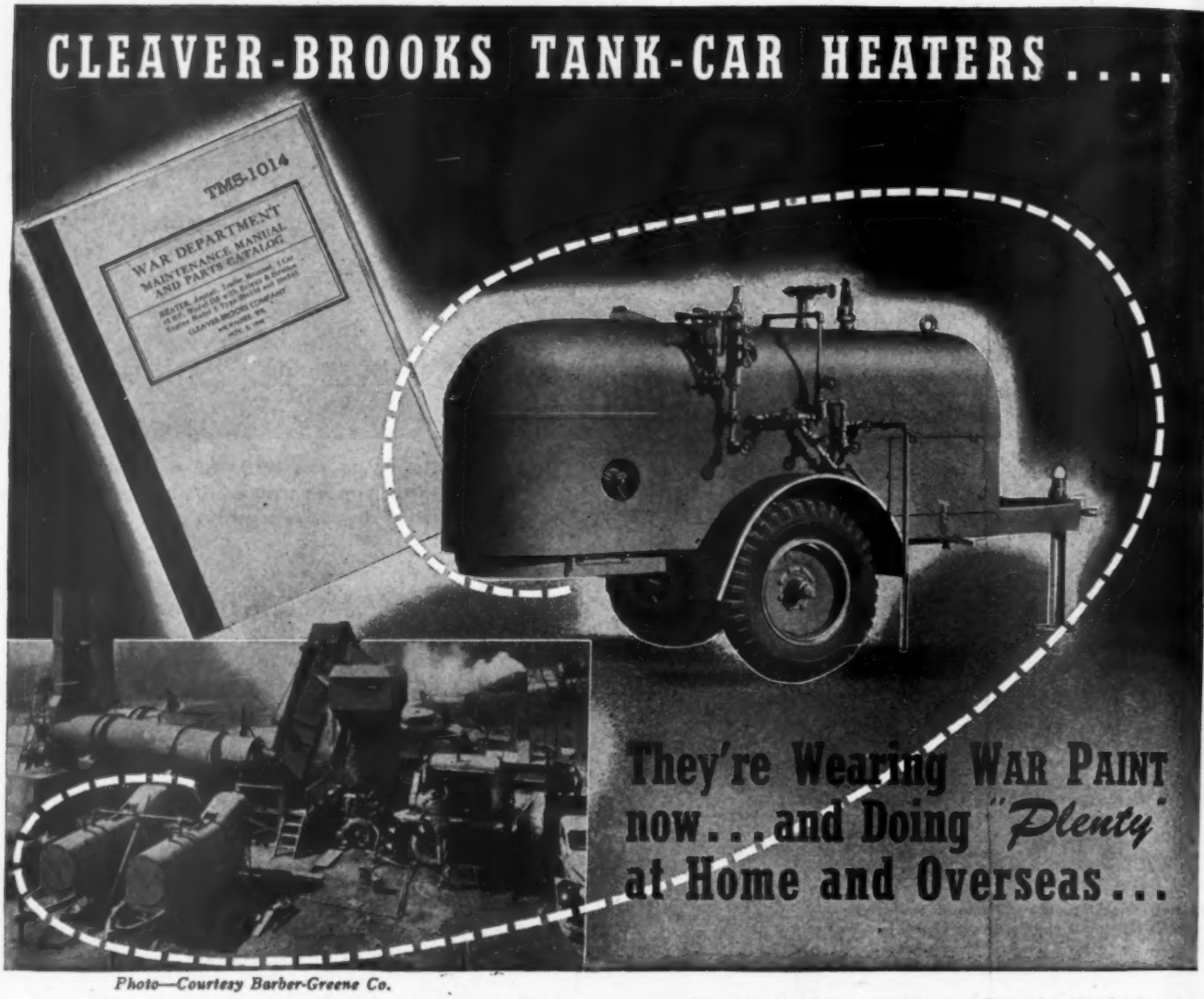
CLEAVER-BROOKS TANK-CAR HEATERS . . . .



They're Wearing WAR PAINT now . . . and Doing "Plenty" at Home and Overseas . . .

Photo—Courtesy Barber-Greene Co.

YES—the same types of Cleaver-Brooks Tank-Car Heaters you road construction men have used and seen in action on America's highways from coast to coast—have gone "G. I."

They're serving with the Army and Air Corps engineers on the far-distant fronts of global war as well as at home bases. Besides their basic task of providing fast, efficient heating of road oils and asphalts, Cleaver-Brooks Tank-Car Heaters are doing scores of other important jobs for the military—emergency heating of quarters—heating water for showers for several hundreds of soldiers at a time—providing live steam to clean off grease on engines in motor trucks—and even being used for vulcanizing operations to retread old tires on military equipment.

Here in the "States" Cleaver-Brooks Tank-Car Heaters are on full-time duty—helping to build and maintain essential highways, auxiliary airports and flight strips.

There's good reason why these Heaters are having "plenty" to do—no other equipment equals Cleaver-Brooks in fast, low-cost performance—no other equipment has the original and exclusive four pass downdraft flue travel and integral burner construction, plus the positive dry-coil method of condensate return.

Get complete information on Cleaver-Brooks Tank-Car Heaters and Bituminous Boosters now—for the jobs to come at war's end.

CLEAVER-BROOKS COMPANY
5106 North 33rd Street • Milwaukee 9, Wisconsin

Cleaver-Brooks

TANK CAR HEATERS . . . BITUMINOUS BOOSTERS . . . AUTOMATIC STEAM PLANTS

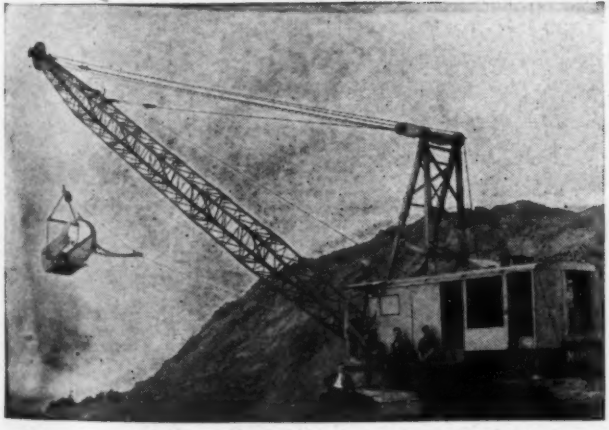
FASTER MANEUVERABILITY
WITH FAWICK CLUTCHES

Perfect Performance

This revolutionary new clutch controls power by air. It is economical. It always works. It needs no arms, levers or toggles. It requires no lubrication or adjustments. Maintenance cost is exceptionally low.

The Fawick Airflex Clutch and Brake has earned its place in heavy-duty service where there is no room for failure. Hundreds are in use on new Navy and Merchant Marine vessels because, more than any other clutch, they permit faster maneuverability — faster starts, quicker stops.

If your equipment needs a clutch, brake, slip clutch or flexible coupling, you are invited to send us details and get our recommendations. Booklet on request.



For Dredges, Draglines and Hoists

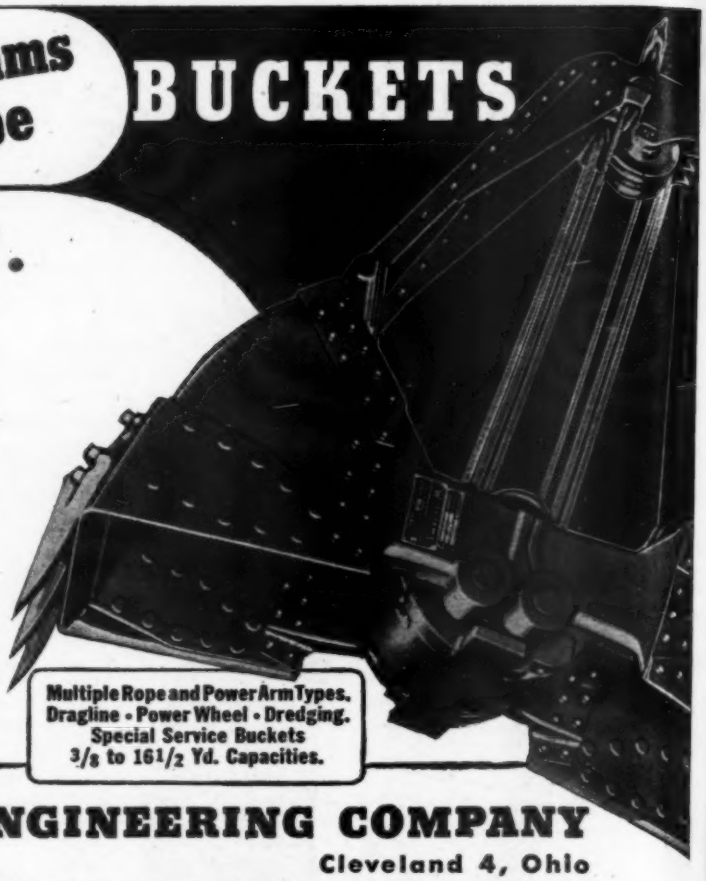
Where heavy loads are handled—where clutch must be engaged and disengaged quick and often, Fawick Airflex Clutches are superior to all other types, for dependable and economical service.

FAWICK AIRFLEX COMPANY, INC.
9919 Clinton Rd. Cleveland 11, Ohio
In Britain, **Crofts Engineers, Ltd., Bradford, England**

FAWICK *Airflex* CLUTCH

POWER CONTROLLED BY AIR

WELLMAN Williams Type BUCKETS



Welded Rolled Steel

FOR GREATER STRENGTH AND LONGER SERVICE

Wellman Buckets combine all the mechanical advantages of the famous Williams Bucket with the welded construction features formerly found in Wellman custom-built heavy duty steel mill buckets.

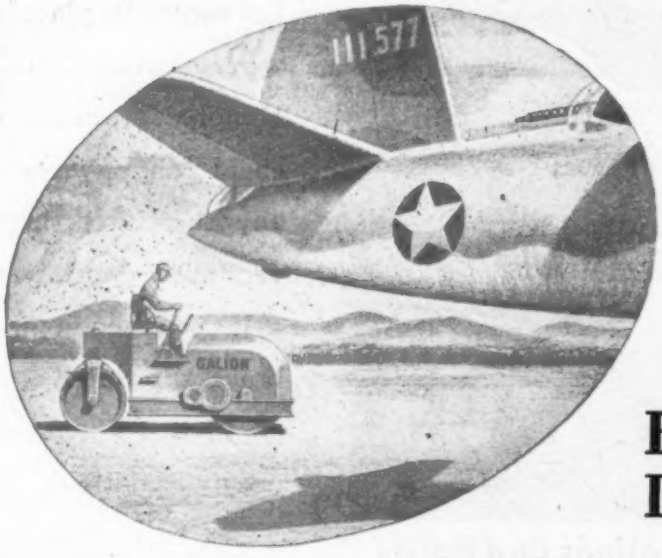
Send for Free Bulletin

Tell us about your particular requirement and we will send full description of construction and features in special bulletins which clearly prove why YOUR NEXT BUCKET SHOULD BE A WELLMAN-WILLIAMS.

Multiple Rope and Power Arm Types.
Dragline • Power Wheel • Dredging.
Special Service Buckets
3/8 to 16 1/2 Yd. Capacities.

THE WELLMAN ENGINEERING COMPANY
7003 Central Avenue — Cleveland 4, Ohio
SALES AND SERVICE AGENCIES IN PRINCIPAL CITIES

GALION ENGINEERS

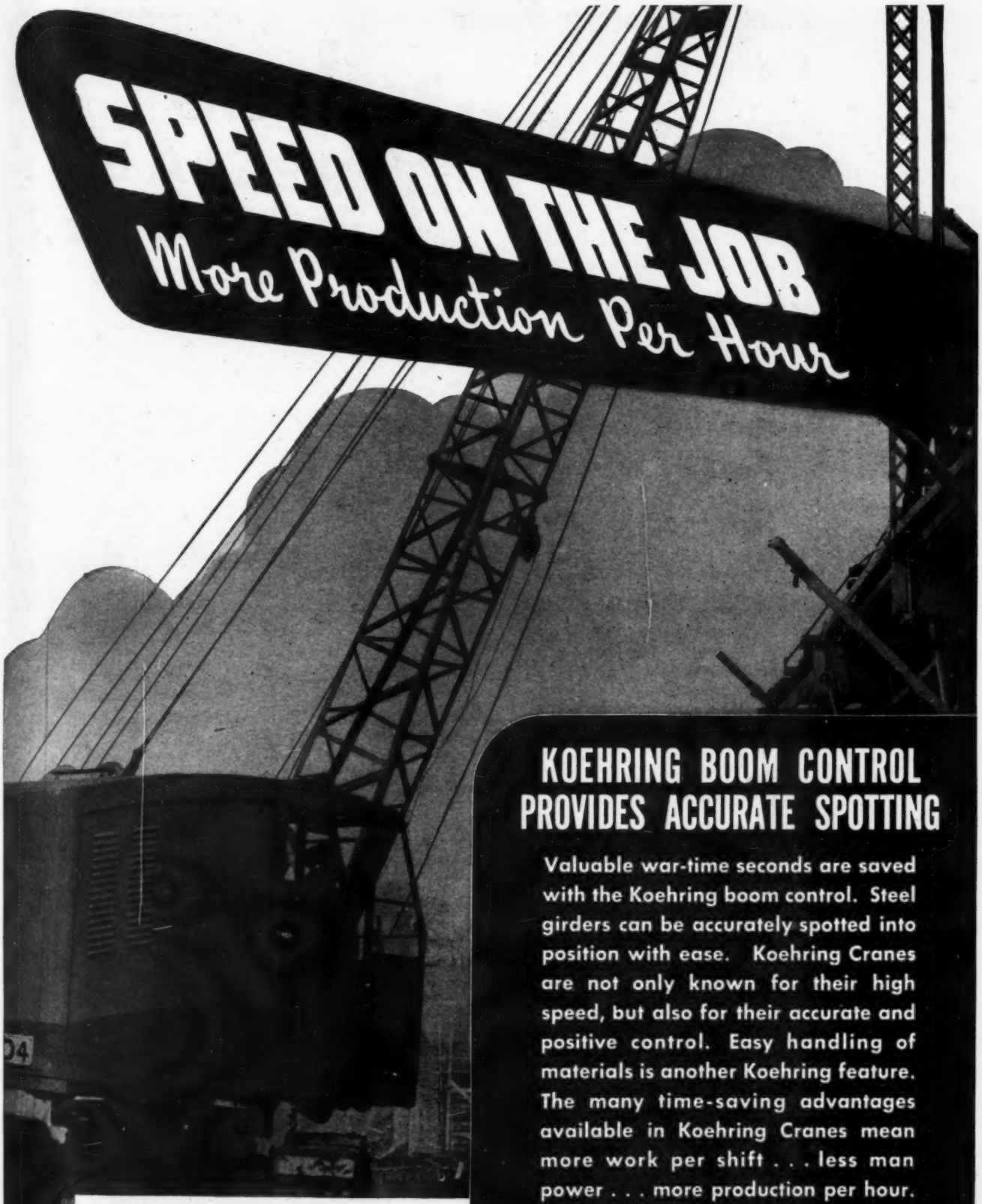


REALIZED LONG AGO

THAT ROAD MACHINERY would have to stand up under a lot of severe service—would have to meet high-speed requirements. Galion engineers built motor graders and road rollers accordingly. As a result, these Galion units are providing top performance on war-construction projects everywhere — helping to speed the final victory. Many road building programs will rely upon Galion after the war.

THE GALION IRON WORKS & MFG. CO.

Main Office and Works: Galion, Ohio



KOEHRING BOOM CONTROL PROVIDES ACCURATE SPOTTING

Valuable war-time seconds are saved with the Koehring boom control. Steel girders can be accurately spotted into position with ease. Koehring Cranes are not only known for their high speed, but also for their accurate and positive control. Easy handling of materials is another Koehring feature. The many time-saving advantages available in Koehring Cranes mean more work per shift . . . less man power . . . more production per hour.

KOEHRING COMPANY
MILWAUKEE 10, WIS.

DEPEND ON YOUR KOEHRING DISTRIBUTOR
to help you keep your equipment operating. Care for your Koehring equipment NOW, so it will serve you tomorrow. Koehring distributors have genuine Koehring parts. Koehring parts warehouses are at your service.

KOEHRING HEAVY DUTY

HEAVY-DUTY CONSTRUCTION EQUIPMENT

Piling Contractors Benefit 4 Ways from Monotubes' SPECIAL FEATURES

WHEN building fast for hard-pressed war plants—and building well for postwar permanence, you can't beat Union Metal all-steel, tapered Monotubes for . . . SPEEDY DRIVING, SPEEDY HANDLING, SPEEDY INSPECTION, and SPEEDY EXTENSION.

Monotubes are so strong and rigid they require no heavy core or mandrel, and can be driven with average job equipment.

Made of cold-rolled steel, yet light in weight, they can be handled quickly and economically, and their hollow tubular design permits easy, thorough inspection prior to concreting.

Extendible Monotubes make possible the installation of varying pile lengths without delay or waste—even in low headroom.

Monotubes are available in a gauge, size and taper to meet the most exacting requirements in any soil condition. Write for Catalog 68A.

THE UNION METAL MANUFACTURING CO. • Canton, Ohio

UNION METAL

Monotube Pile Casings

Built to set the pace

and HOLD IT!

After more than a decade of duty in all types of construction equipment on the kind of jobs that really put power "through the wringer"—this fact about Cummins Dependable Diesels stands out like an unbroken window in Berlin: They are built to set the pace in dependability, economy and speed —*and hold it!* Day and night . . . until the job is wrapped up and delivered.

CUMMINS ENGINE COMPANY

Columbus, Indiana

KNOW YOUR

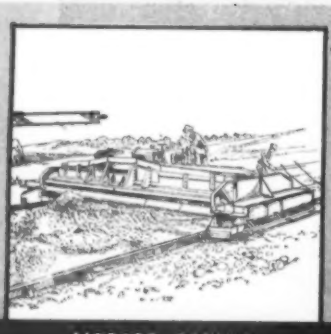
The family of Blaw-Knox Distributors covers every part of the United States and Canada. They employ mechanical and technical experts with a vast background of experience acquired through many years in the industry that will help you in the proper adjustment, repair, maintenance, lubrication, etc. of your Blaw-Knox Construction Equipment.

Many items of Blaw-Knox Construction Equipment are available for domestic users on essential projects — within limits of government regulations. Your Blaw-Knox Distributor will handle your inquiry promptly and efficiently.

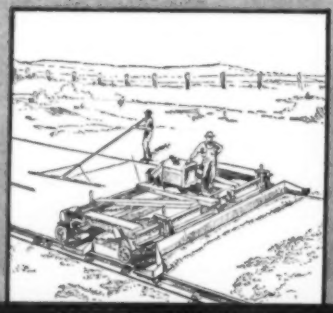
There is a Blaw-Knox Distributor near you — look him up and get to know him — he is ready to help you.

ARMY E NAVY

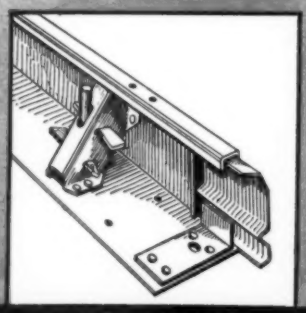
BACK THE ATTACK
WITH WAR BONDS AND STAMPS



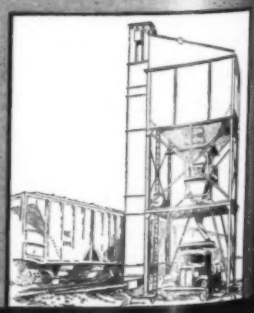
AIRPORT PAVING SPREADERS



AIRPORT FINISHING MACHINES



AIRPORT PAVING FORMS



BULK CEMENT PLANTS

AGGRE

Many of the distributors listed below have represented Blaw-Knox for 20 years or more. All of them are leading construction equipment dealers in their respective territories.

BLAW-KNOX DISTRIBUTOR!

ALABAMA
Birmingham — Young & Vann Supply Co.
ARIZONA
Phoenix — State Tractor Equipment Co.
ARKANSAS
Little Rock — Lyons Machinery Company
CALIFORNIA
Los Angeles — Le Roi-Rix Machinery Co.
— E. M. Ornitz
San Francisco — C. H. Grant Company
COLORADO
Denver — Ray Corson Machinery Co.
CONNECTICUT
New Haven — W. I. Clark Co.
DELAWARE
Philadelphia, Pa. — Giles & Ransome
DISTRICT OF COLUMBIA
Washington — Matt A. Doetsch Mach. Co.
FLORIDA
Jacksonville — Florida Equipment Company of Jacksonville
Miami — Florida Equipment Company of Miami
Tampa — Epperson & Company
Birmingham, Ala. — Young & Vann Supply Co.
GEORGIA
Atlanta — W. C. Caye & Company
IDAHO
Boise — Intermountain Equip. Co.
Spokane, Wash. — Empire Equip. Co.
ILLINOIS
Chicago — O. T. Christerson Co.
Davenport, Ia. — Gierke-Robinson Co.
St. Louis, Mo. — O. B. Avery Company
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Indianapolis, — Reid-Holcomb Co.
Chicago, Ill. — O. T. Christerson Co.
Louisville, Ky. — Brandeis Machinery & Supply Co.
IOWA
Davenport — Gierke-Robinson Co.
Des Moines — Herman M. Brown Co.
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Kansas City — G. W. Van Keppel Co.
KENTUCKY
Louisville — Brandeis Mach. & Supply Co.
Columbus, Ohio — W. W. Williams Co.
LOUISIANA
New Orleans — Southern States Equipment Co.
MAINE
Portland — Stanley-Cadigan Company
MARYLAND
Baltimore — Henry H. Meyer Co., Inc.
Washington, D. C. — Matt A. Doetsch Machinery Co.
MASSACHUSETTS
Boston — The Equipment Company
New Haven, Conn. — W. I. Clark Co.
MICHIGAN
Detroit — Wm. P. Favorite Company
Grand Rapids — Contractors Mach. Co.
Iron Mountain — Service & Supply Division of Lakeshore Engineering Company
MINNESOTA
Duluth — Borchert-Ingersoll, Inc.
St. Paul — Borchert-Ingersoll, Inc.
MISSISSIPPI
Amory — Dalrymple Equip. Co.
New Orleans, La. — Southern States Equipment Co.
MISSOURI
Kansas City — G. W. Van Keppel Co.
St. Louis — O. B. Avery Company
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Billings — Western Construction Equip. Company
NEBRASKA
Omaha — Anderson Equipment Co.
NEVADA
Los Angeles, Cal. — E. M. Ornitz
San Francisco, Cal. — C. H. Grant Co.
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New York, N.Y. — R. E. Brooks Company
Philadelphia, Pa. — Giles & Ransome
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Albuquerque — Hardin & Coggins
NEW YORK
Albany — Larkin Equipment Co.
Buffalo — Trevor Corporation
Elmira — LeValley, McLeod & Kinkaid Co., Inc.
Endicott — Newing Motors Co., Inc.
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Rochester — Keystone Builders Supply Co., Inc.
Syracuse — Syracuse Lumber Co.
Utica — McQuade & Bannigan, Inc.
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Salisbury — Carolina Tractor & Equip. Co.
NORTH DAKOTA
Fargo — Dakota Tractor & Equipment Co.
OHIO
Cleveland — H. B. Fuller Equipment Co.
Columbus — W. W. Williams Co.
Pittsburgh, Pa. — Dravo-Doyle Company
OKLAHOMA
Oklahoma City — Leland Equipment Co.
OREGON
Portland — Contractors Equipment Corp.
PENNSYLVANIA
Philadelphia — Giles & Ransome
Pittsburgh — Dravo-Doyle Company
RHODE ISLAND
Boston, Mass. — The Equipment Co.
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Columbia — Jeff Hunt Road Machinery Co.
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Nashville — Wilson-Weesner-Wilkinson Co.
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Milwaukee — Hunter Tractor & Mach. Co.
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WYOMING
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BLAW-KNOX

BLAW-KNOX DIVISION
OF BLAW-KNOX COMPANY
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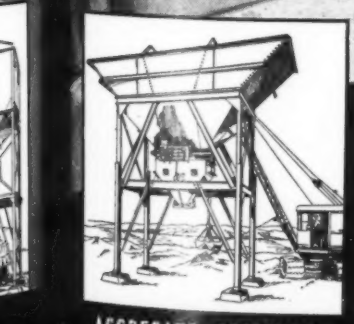
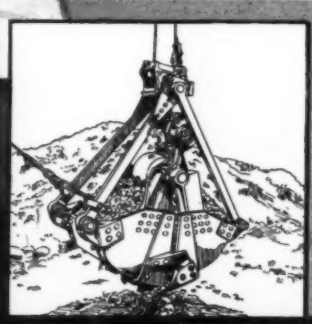
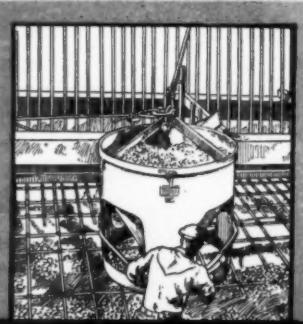
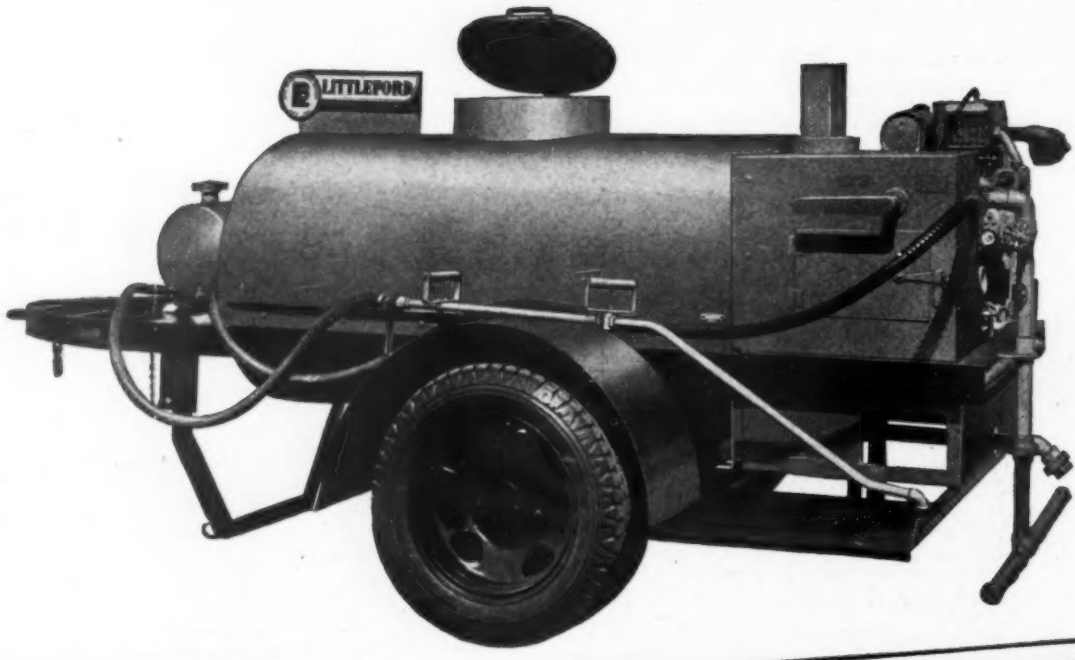

AGGREGATE BATCHING PLANTS


CLAMSHELL BUCKETS

SHEEPSFOOT TAMPING ROLLERS


CONCRETE BUCKETS



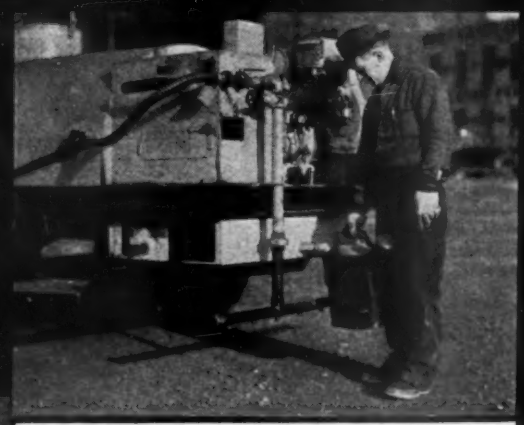
MODEL No. 101 UTILITY SPRAY TANK

Here's a Unit that will cut post war Black Top Construction and Maintenance costs to a minimum. Designed by Littleford to do three jobs instead of one. Making it three separate Units all in one.

Model No. 101 will handle tar, asphalt, cutback, and emulsion. Model No. 101 is heated by Littleford Vaporizing Torch Type Burners.

When planning for the future, include a Littleford Model No. 101 Utility Spray Tank, why purchase three units when the No. 101 will do the work.

1 Model No. 101 can be used as a Distributor, has Spray Bar for small application jobs.



2 For crack filing, Model No. 101 has pouring pot outlet.

3 Spraying patches with the Hand Spray is the popular use for the Model No. 101.

BLACK TOP ROAD MAINTENANCE EQUIPMENT LB SINCE - 1900

LITTLEFORD

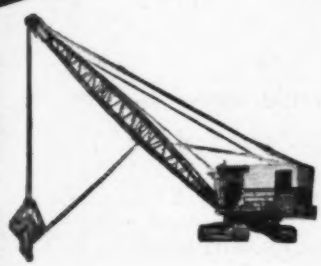
Littleford Bros., Inc.
454 E. Pearl St., Cincinnati, Ohio

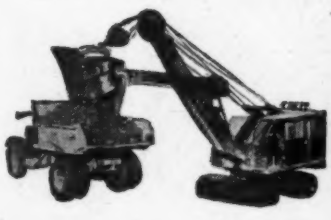
THERE IS A MARION OF THE RIGHT SIZE AND CAPACITY TO SPEED UP EVERY MATERIAL HANDLING JOB.

Look for MARIONS *to dominate the post-war construction program*

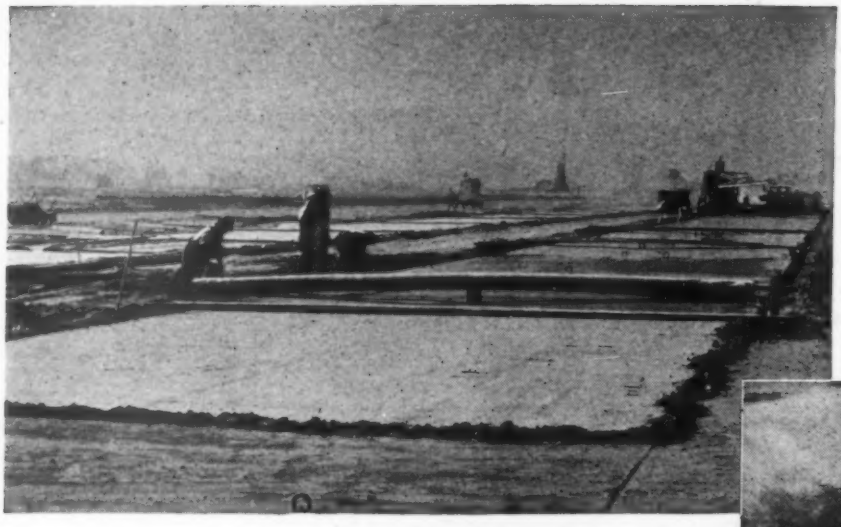
MARIONS have been in the thick of this war establishing production records of their own, both at home and abroad. MARIONS' outstanding achievements during this time, the most trying period of their sixty years of material handling, are proof of the dominant position these machines will hold in the post-war construction program. They will dominate because they more than measure up to the tremendous job ahead.

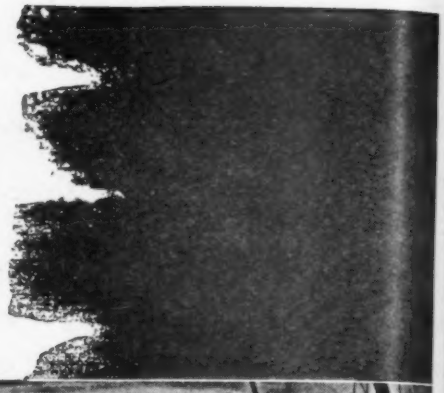
THE MARION STEAM SHOVEL CO.
MARION, OHIO

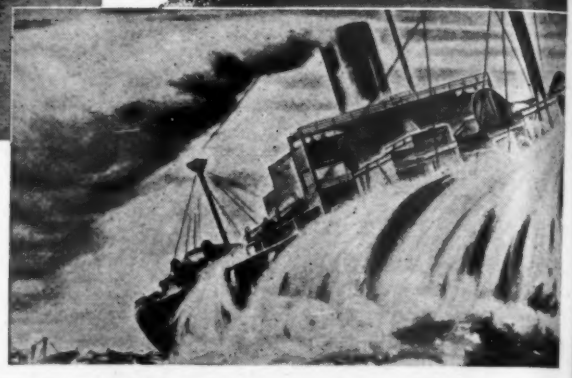




CRANES ★ PULL-SHOVELS
CLAMSHELLS ★ SHOVELS
DRAGLINES ★ WALKERS
FROM ¾ TO 35 CUBIC YARDS







SISALKRAFT

Protects Deck Loads of War Supplies as Successfully as it Blankets Newly Poured Concrete...

Sisalkraft, the tough, weatherproof, concrete curing agent, now safeguards war supplies enroute to fighting fronts!

The very qualities that made Sisalkraft so much in demand for concrete curing blankets, and general job protection are the reasons why this versatile material is a war essential.

The unmatched, weatherproof qualities of Sisalkraft, enable it to keep even deck loads of war supplies in usable condition during long exposure to ice, sleet, snow, salt water, rain and wind. Its outstanding resistance to tearing and scuffing make Sisalkraft the ideal "wrapper" for war goods subject to rough handling.

In any month of war service, Sisalkraft is taking terrific abuse — more than it would *ever* get as a concrete curing agent — and "taking it standing up!"

With the dawn of peace, Sisalkraft blankets, covers and rolls will again be ready to serve you as dependably as they are now serving our Nation and our Allies. Include Sisalkraft in your plans for your postwar work.

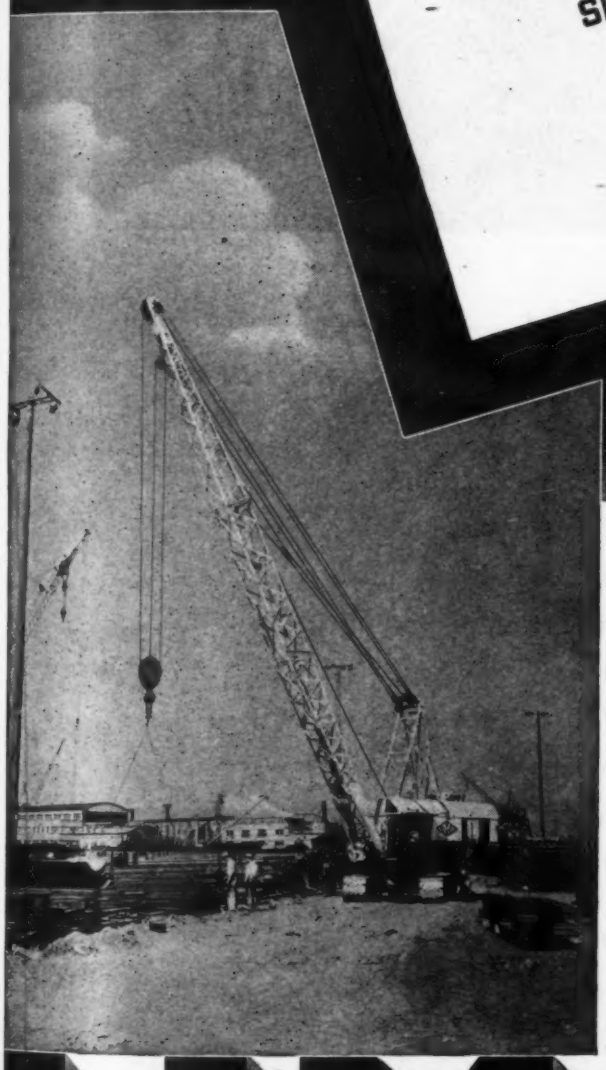
THE SISALKRAFT CO.
205 W. WACKER DRIVE · CHICAGO, ILL.
NEW YORK · SAN FRANCISCO · LONDON · SYDNEY

Manufacturers of SISALKRAFT, FIBREEN, SISAL-X, SISALTAPE AND COPPER-ARMORED SISALKRAFT

WE ARE NOT MAKING AS MANY CALLS AS WE DID —

LIMA

LIMA LOCOMOTIVE WORKS, INCORPORATED
SHOVEL AND CRANE DIVISION
LIMA, OHIO



but we want you to know that we are still on the job building Cranes, Shovels and Draglines without precedent, most of them earmarked for the "Armed Forces". With Uncle Sam demanding the greater part of our output and the fact that many of our sales representatives and service men have answered the call to the colors, while others are now procuring and expediting materials, we have been unable to make as many calls as we would like to on our friends and customers.

We miss those friendly contacts and opportunities to serve you. Let us hope that it will not be long before we can see you regularly and give your excavator needs our undivided attention. Your patience has been magnificent when we have had to say "no" when you needed that new LIMA so badly, but we know that you like ourselves have but one thought in mind—VICTORY and until then the armed forces must continue to have preference.

LIMA LOCOMOTIVE WORKS, INCORPORATED
Shovel and Crane Division - - - - - - LIMA, OHIO

NEW YORK, N. Y. PHILADELPHIA, PA. NEWARK, N. J. MEMPHIS, TENN.
SAN FRANCISCO, CALIF. DALLAS, TEXAS. PORTLAND, ORE. LOS ANGELES, CALIF.
SEATTLE, WASH. SPOKANE, WASH. MINNEAPOLIS, MINN. ST. LOUIS, MO.
MONTREAL, Quebec, Can. VANCOUVER, B. C.

LIMA SHOVELS CRANES . DRAGLINES

SHOVELS, ¾ YD. TO 3½ YD. CRANES, 13 TONS TO 65 TONS
DRAGLINES, VARIABLE

SYMBOL OF SNOW DEFENSE

Yesterday . . TODAY . . *Tomorrow*

The Wausau Trademark stands for more than 20 years of leadership in the snow removal field — more than a guarantee of complete satisfaction — more than streamlined action backed by battleship strength. It stands for "Service to Customers" too for in spite of the fact that we have gone "all out for war" we will not let our dealers down. You can still get snow plows from us on authorized orders and you are assured of prompt service on repair parts.

We have met the emergencies of yesterday and the *Wausau* tradition of service shall continue today and tomorrow because the highways — the arteries of the war production program — MUST STAY OPEN.

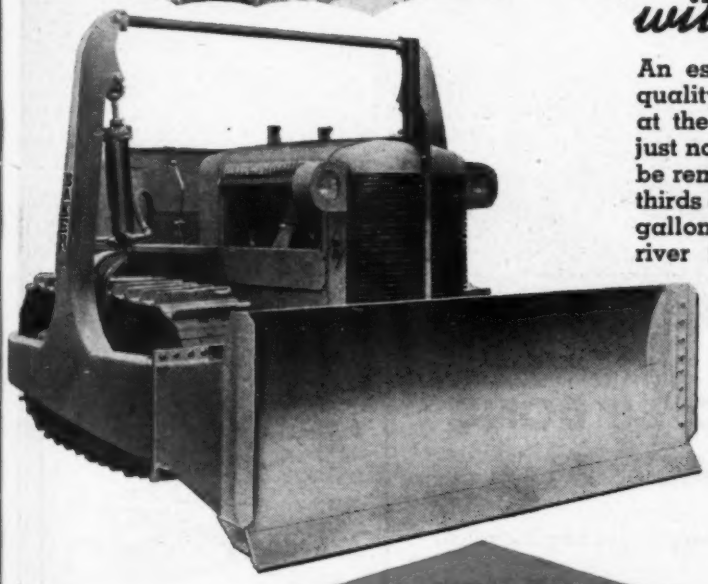
WAUSAU IRON WORKS • WAUSAU, WIS.

Opening a Lake Bottom Iron Mine

Baker *Hydraulic* Gradebuilder on an Allis-Chalmers tractor skidding a scow over a Baker-built road, from the railroad to the "under-lake" mining project. C. A. Pitts, Ltd., Toronto, Ont. are general contractors.

...with Baker Bulldozers!

An estimated 30 million tons of much-needed, good quality Bessemer hematite iron ore, in three lodes, lie at the bottom of Steep Rock Lake, Ontario, Canada, just north of the Minnesota border. Five-sixths of it can be removed by open pit mining. To get at the ore, two-thirds of the lake must be drained, involving 125 million gallons of water, and the other third dammed off. A river flowing through the lake must be re-routed making use, where possible, of adjacent lakes and existing streams. This will necessitate numerous dams, earth fill dikes, excavation of channels, clearing of land and the building of many roads, each from 3 to 15 miles long. Finally, right-of-way must be built for trackage from the mine to a railroad 3 miles away.



Baker *Hydraulic* Bulldozers and Gradebuilders are made in 12 models.

Logically, a number of Baker *Hydraulic* Bulldozers and Gradebuilders are being used to rush this job to completion. Operations were started in the spring of 1943. Baker's capacity for getting vast quantities of dirt moved faster—its ability to 'doze trees, logs and boulders and to pile, spread, level and compact, make it tailor-made for this job.

Bakers are earning "Distinguished Earth-moving Crosses" on scores of war jobs, piling up performance records that deserve your attention when you buy post-war equipment!

Awarded the Army-Navy "E" flag for proficiency in production.

THE BAKER MFG. CO.

506 Stanford Ave. Springfield, Ill.

"If It Concerns Victory, It Concerns Us!"

BAKER

The Modern Tractor Equipment Line for

EARTH MOVING
LEVELING AND GRADE BUILDING
SNOW REMOVAL
ROAD MAINTENANCE

WHEN THERE'S WORK TO BE DONE —IN WAR OR PEACE

YOU will find GM Diesels hard at work in every theater of the war. They power massive tanks moving into battle, heavy trucks in endless supply lines, tractors to clear landing fields, landing and assault boats, big submarines and fast subchasers in home and in foreign waters.

In every respect, these GM Diesel Engines are living up to all that was predicted for them—and more. In many instances they are doing an even greater variety of jobs than they were designed for. They are standing up under conditions that couldn't possibly have been foreseen.

When the war is over, GM Diesels will be ready to serve the peace as they are serving in war. With this difference: expanded production facilities, together with improvements and refinements in design and construction, will make them even more available for use—more capable of reliable, low-cost performance.

Tomorrow

Reconstruction and new construction are going to need plenty of this hard-hitting, easy-on-the-fuel power. With normal refinement and development speeded up by war, with production expanded, GM Diesels will be ready to serve in more fields and in more ways than ever.

GM
GENERAL MOTORS
DIESEL POWER

ENGINES..15 to 250 H.P...DETROIT DIESEL ENGINE DIVISION, Detroit, Mich.

ENGINES..150 to 2000 H.P...CLEVELAND DIESEL ENGINE DIVISION, Cleveland, Ohio

LOCOMOTIVES.....ELECTRO-MOTIVE DIVISION, La Grange, Ill.

TO BUILD A HIGHWAY AND BUILD IT FAST!..

Put a LINK-BELT SPEEDER on the job!

These mobile, powerful machines are turning in outstanding records for performance wherever they are in operation. Virtually maintenance-free, they can be kept at their job without needless delays for repairs. Finger-tip control permits easy operation and eliminates fatigue on the part of the operator. Designed and engineered for rugged performance under any and all conditions, Link-Belt Speeder is pointing the post-war way to efficient road building operation.

9363-A

LINK-BELT SPEEDER

Builders of the Most Complete Line of
SHOVELS-CRANES-DRAGLINES

LINK-BELT SPEEDER CORPORATION, 301 W. PERSHING ROAD, CHICAGO-9, ILL.
(A DIVISION OF LINK-BELT COMPANY)

M S

The Heavy Wrecker

leading the procession may be No. OOW212 to the Ordnance Department, but it's "Superman" to the fellow who drives it. If your eyes are sharp, maybe you can recognize the second truck as "MacArthur". A "cute" little 28 thousand pound job in Tunisia was affectionately christened "Amapola" by its crew.

When our soldiers apply such nicknames to the planes, tanks and trucks they operate, it's a completely unofficial but particularly sincere endorsement of equipment they have come to like, respect and depend on.

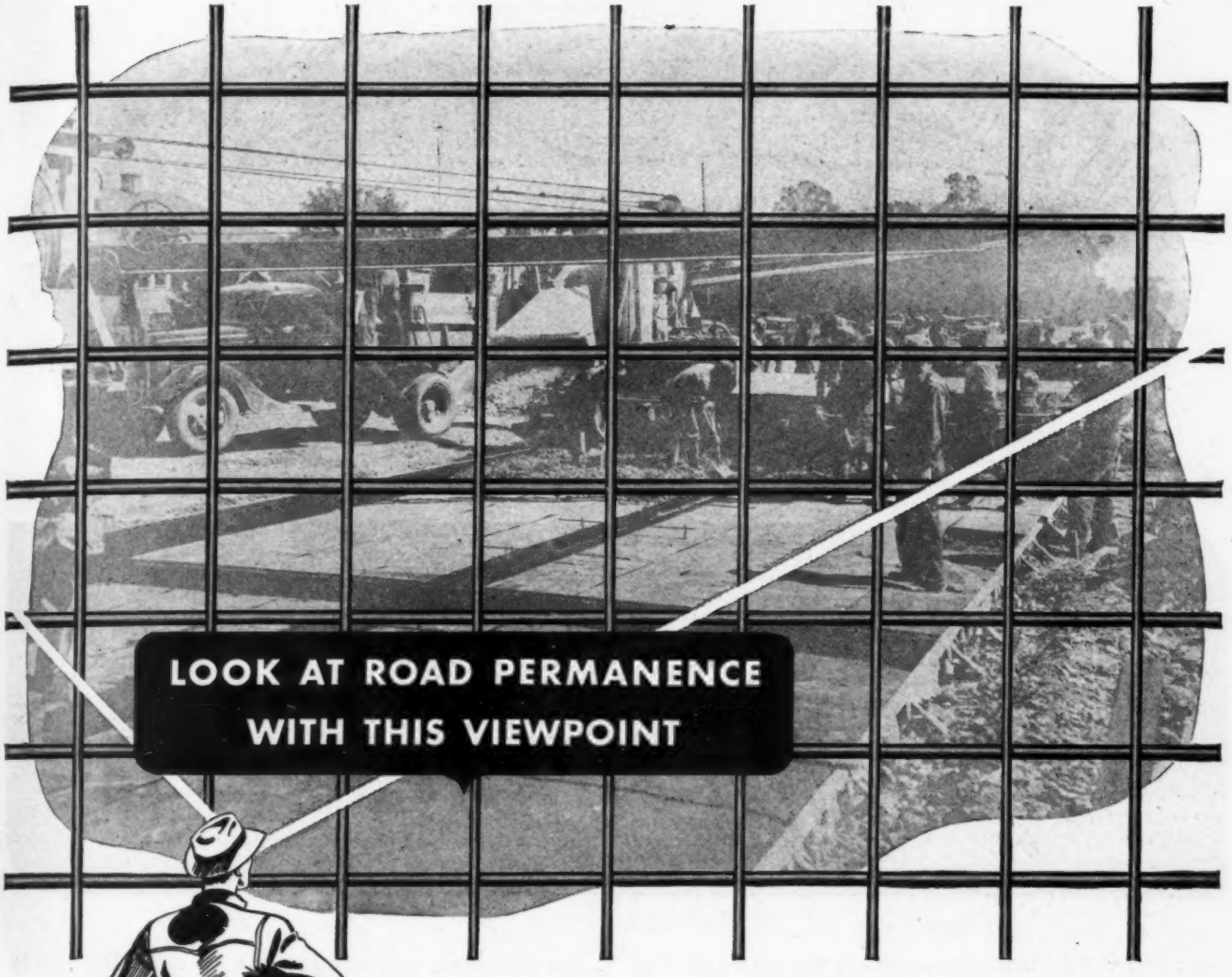
If we have the postwar privilege of supplying you with trucks engineered to the job they are to perform, we think you will find them similarly deserving of admiration and confidence of those who use them.

● FIRE APPARATUS

WARD LaFRANCE
TRUCK DIVISION
GAI GREAT AMERICAN INDUSTRIES
★ ELMIRA ● NEW YORK ★

● COMMERCIAL TRUCKS

© 1944 G. A. I., Inc., Meriden, Conn



Steel for Roads that Endure!

The use of Truscon Welded Steel Fabric Reinforcement, in conjunction with other specialized Truscon road-building products, is recognized by authorities as the dependable way of assuring long-life concrete pavements and bases, over all subgrades.

Engineers and designers have found by experience, practice and research that the following advantages can be expected from Truscon Welded Steel Fabric Reinforcement:

Provides resistance to cracking due to shrinkage of concrete during setting period.
Provides tensile strength necessary to resist subgrade friction.
Provides increased resistance to cracking in concrete slabs created by expansion and contraction of subgrades.
Provides increased resistance to cracking of concrete due to load.
Prevents the development of microscopic cracks into visible cracks.
Prevents cracks from opening and allowing the entrance of water.
Prevents broken ends of slabs from separating at a crack.
Decreases the possibilities of spalling and progressive breakage.

All these, and many other advantages, are yours with Truscon Welded Steel Fabric Reinforcement, and associated roadbuilding products. Use them, and follow the Truscon blueprint for better roads, to assure lasting prestige for you and more permanent highways for the communities you serve.

ARMY E NAVY

TRUSCON
Steel Company
YOUNGSTOWN 1 • OHIO

SUBSIDIARY OF REPUBLIC STEEL CORPORATION

THAT BRIDGE OF TOMORROW CAN BE *planned* TODAY

As a highway or municipal engineer you have a double responsibility. Not only will you want to make your plans to provide jobs for returning service men and war workers, but these plans must fit a postwar world, the pattern of which is not yet clear.

You can find a practical answer to your postwar bridge problems on both of these counts by specifying ARMCO Multi Plate Pipe and Arches. This way you get a strong, durable, basic structure that can be easily installed by unskilled labor. At the same time you assure a flexibility in design and appearance that will enable you to conform to postwar standards. With ARMCO Multi Plate to support the load you can finish the bridge with any type of design and material you choose.

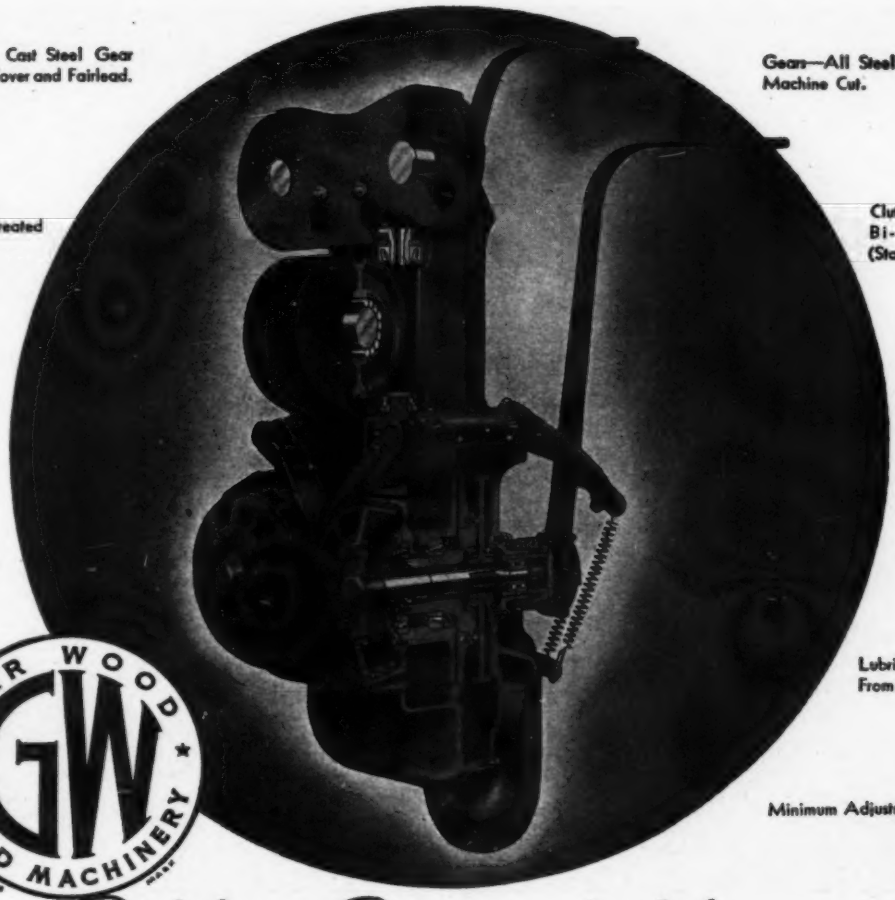
Other advantages include ease of transportation, quick assembly on the job site without special equipment, and freedom from maintenance.

Include ARMCO Multi Plate in your postwar plans even though you may not be able to get it for your immediate construction needs. After the war it will again be available for bridges, stream enclosures, large sewers and special drainage structures. Write us for complete data. Armco Drainage Products Assn., 35 Curtis St., Middletown, O.

ARMCO

ARMCO

MULTI PLATE PIPE AND ARCHES


Heavy Cast Steel Gear Case, Cover and Fairlead.
Gears—All Steel—Machine Cut.
All Shafts Heat Treated and Ground.
Clutch—Cone Type with Bi-Metallic Facing (Standard Equipment).
Bearings—Ball and Roller.
Brake—Servo—External Band Type—Low Drag.
Large Sheaves.
Ventilated—Clutch and Drum.
Lubrication—Automatic From Gear Case.
Minimum Adjustments.

GAR WOOD GW ROAD MACHINERY

Cable Control Units

GIVE OUTSTANDING PERFORMANCE

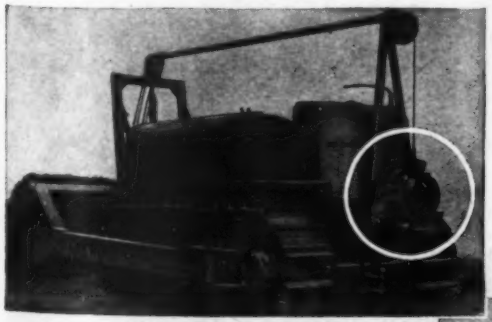
Features provided in the simplified "Clean-Cut" design of Gar Wood Cable Control Units make this "top" performance possible.

GW Road Machinery operated by Gar Wood Cable Control Units is a component fighting unit in the United Nations' drive for Victory!

SPECIFICATIONS

Cable Capacity (½"—6 x 19) Per Drum	185,
Line Pull—Bare Drum	7500 Lbs.
Line Pull—Full Drum	4530 Lbs.
Line Speed—Bare Drum (1-2-5 Trans. Gear)	270 Ft. Per Min.
Line Speed—Bare Drum (3-4-6 Trans. Gear)	433 Ft. Per Min.
Line Speed—Full Drum (1-2-5 Trans. Gear)	477 Ft. Per Min.
Line Speed—Full Drum (3-4-6 Trans. Gear)	718 Ft. Per Min.

The GW Road Machinery Line is Complete—Consisting of both Hydraulic and Cable-Operated Units



Gar Wood Bulldozer operated by SINGLE-DRUM Cable Control Unit.

Gar Wood earth-moving Scraper operated by GW DOUBLE-DRUM Cable Control Unit.

BONDS SPEED VICTORY

ROAD MACHINERY DIVISION
GAR WOOD INDUSTRIES, Inc.
DETROIT 11, MICHIGAN

GW ROAD MACHINERY is Sold Through **ALLIS-CHALMERS** Dealers Everywhere

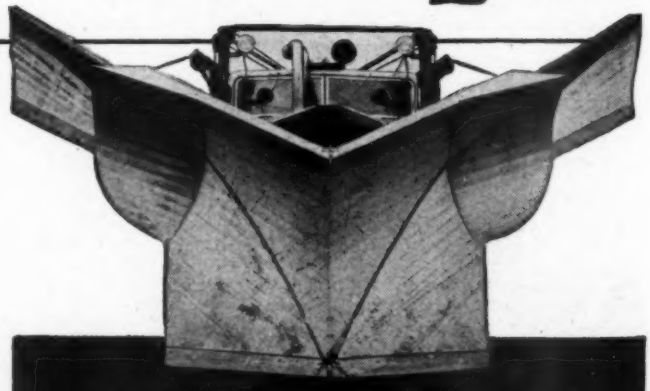
WHEN BATTLING DRIFTING SNOW—

You've got to work *Fast* to make your work *Last*

YOUR opening run is wasted when drifts refill the road before you can get back for widening out. Speedier snow removal is the only solution—and no other equipment can clear snow as fast as a Walter Snow Fighter. These powerful units smash through road-blocking drifts—hurl snow far to the side—speed widening-out—prove more than a match for any combination of wind and snow!

Walter Snow Fighters maintain high speeds through snow because their tremendous power is translated into smooth, positive traction by the exclusive Walter Four-Point Positive Drive. Three automatic locking differentials proportion the power to each of FOUR driving wheels according to its traction at any instant. There is no "wheel spinning", "side slipping" or stalling to reduce speed. If one wheel loses traction momentarily on a slippery surface, *its mates continue to operate under full power!*

For the complete story on Walter Snow Fighters, send for detailed literature.



WALTER
SNOW FIGHTERS

WALTER MOTOR TRUCK COMPANY
1001-19 IRVING AVENUE, RIDGEWOOD 27, QUEENS, L. I. N. Y.

Cedarapids

Built by IOWA

235,064 miles of railway line stretch across these United States and a large percentage of that track lies in Cedarapids crushed ballast. Keeping the war-loaded side-door pullmans and the troop-loaded polished cars rolling is an important war job and forms another part of the great story of what aggregate producing equipment manufacturers and the contractors using crushing equipment are doing.

It is not the outstanding or unusual record figures made under ideal conditions that deserve consideration. It is the day after day high average output figures that are typical of Cedarapids plant production that mean successful contracts and that should influence plans for future purchases.

When you roll out 1000 to 1500 yds. day after day month after month and *depend on it,* then you *can really make plans* and know what you are doing. That's what Iowa equipment will mean to you on your postwar contracts.

Come to Headquarters for aggregate producing equipment.

THE IOWA LINE
of Material Handling Equipment
Includes

ROCK AND GRAVEL CRUSHERS
BELT CONVEYORS — STEEL BINS
BUCKET ELEVATORS
VIBRATOR AND REVOLVING SCREENS
STRAIGHT LINE ROCK AND GRAVEL PLANTS
FEEDERS — TRAPS
PORTABLE PLACER MACHINES
PORTABLE POWER CONVEYORS
PORTABLE STONE PLANTS
PORTABLE GRAVEL PLANTS
REDUCTION CRUSHERS
BATCH TYPE ASPHALT PLANTS
TRAVELING (ROAD MIX) PLANTS
DRAG SCRAPER TANKS
WASHING PLANTS
TRACTOR-CRUSHER PLANTS
STEEL TRUCKS AND TRAILERS
KUBIT IMPACT BREAKERS

IOWA MANUFACTURING CO., CEDAR RAPIDS, IOWA

The record of Perfection Truck Bodies for superior performance, endurance and modern practical design has always made them the favorite of hundreds of Contractors and Building Supply Dealers. That same record has made Perfection Bodies in great demand for military service, and has caused them to roll in ever-increasing numbers to the far corners of the world.

We hope that in a short time a tapering off of Government orders and restrictions may permit us to supply your requirements for Dump Bodies and Hydraulic Hoists, Stake Bodies and Special Purpose Bodies. Watch our ads for future announcements. Write for names and addresses of Distributors near you—also Bulletin and prices.

THE PERFECTION STEEL BODY COMPANY - - GALION, OHIO

ARMY E NAVY

PERFECTION

TRUCK BODIES AND HOISTS

HANSON

CRANES

4 and 6 Ton Capacity

Crawler or Truck Mounted

CONVERTIBLE TO

CRANE—DRAGLINE—CLAMSHELL

PILE DRIVER—TRENCH HOE—SHOVEL

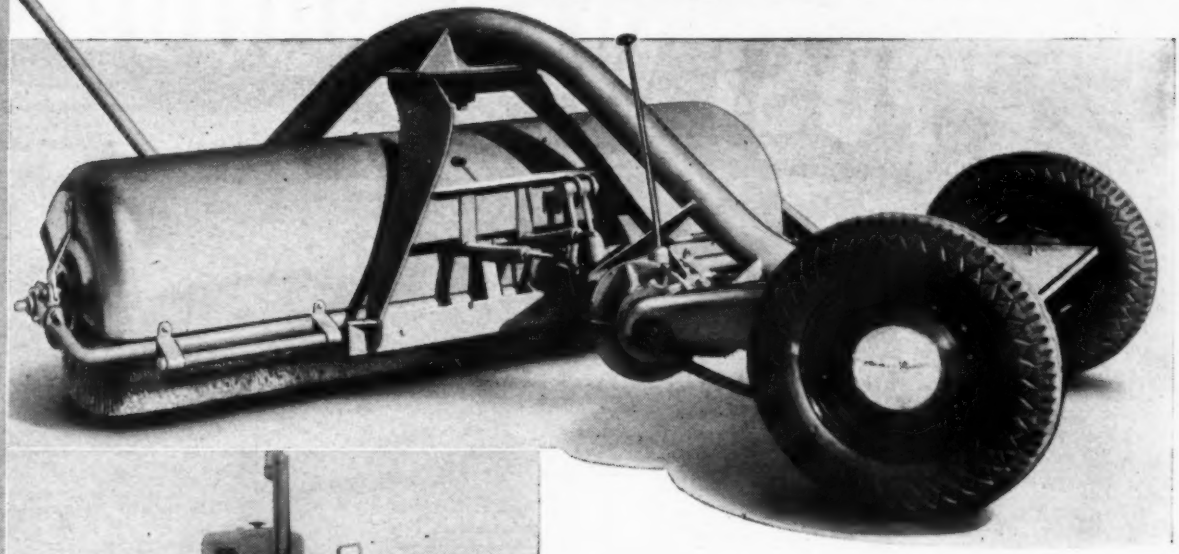
Full Revolving—Lattice Welded Steel Boom—Balanced Design—Low Center of Gravity—Rugged—Flexible—Heavy Industrial Type Motor, Gasoline or Diesel.

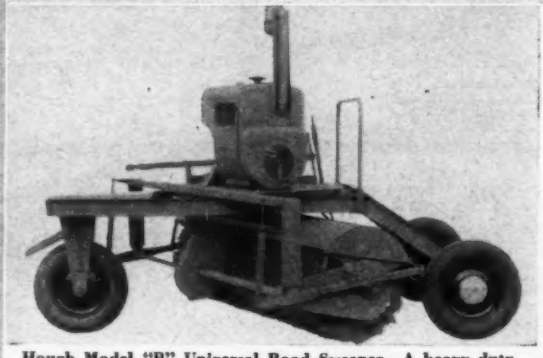
Our entire factory facilities is being used for the production of Crawler Cranes for the U. S. Navy. However, all present Hanson equipment owners are assured that any order for repairs will receive our immediate attention and shipped promptly.

THE HANSON CLUTCH & MACHINERY CO.

PHONE 417 **TIFFIN, OHIO**

There's a HOUGH SWEEPER *for every requirement*





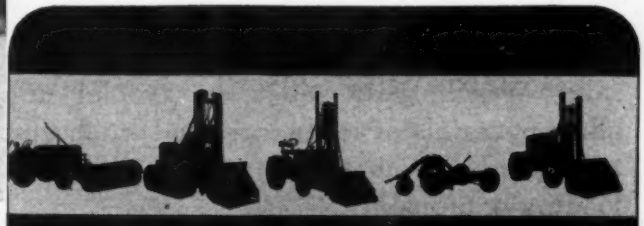
Hough Model "B" Universal Road Sweeper. A heavy duty, engine-driven machine with a sweeping path of 72". Two direction brush sweeps to either right or left, at adjustable speed.

Hough Tractor Sweeper. A power-driven rotary broom mounted on a small tractor; making an efficient unit for general sweeping and snow removal.

Hough Combination Tractor Sweeper-Blower. A low cost complete unit with a 6' sweeping path. Sweeper readily detached. Ideal for removing dust and fines from old surfaces before prime or seal coating.

Types for every municipal, county, state and airport need and for road builders and contractors. Universal Tu-way traction powered units like the one above for use with trucks and tractors, Universal engine-driven units and units for attachment to the front end of wheeled tractors. Also sweeper-blower combinations. Provide effective removal of snow, dirt and debris.

THE FRANK G. HOUGH CO.
Libertyville, Illinois



HOUGH

"HUFF"

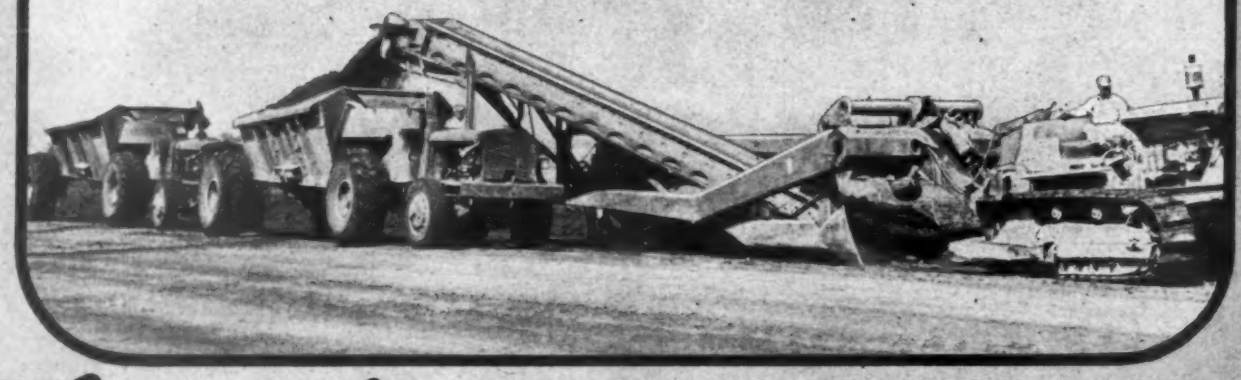
Tractor Shovels

ARMY E NAVY

Road Sweepers

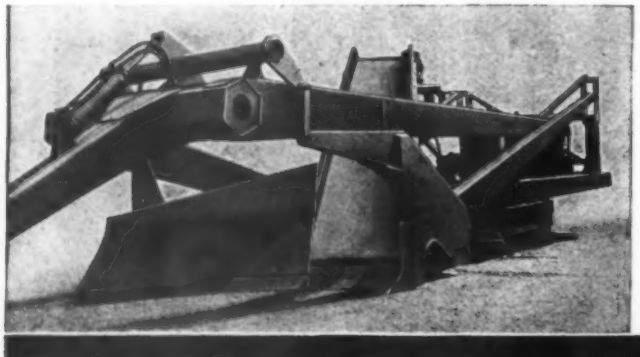
Here's a

"POST WAR PRODUCT"



Ready for TODAY'S JOBS!

Backed by more than a year and a half of exhaustive tests and actual production operation, this new earth moving tool has proved its ability to load dirt faster and cheaper. The Model BV EUCLID LOADER is built to match the speed, versatility and efficiency of other Euclid equipment. It will load loose sand, gravel, shale, muck, heavy clay and other materials at lower cost and in shorter travel distance than other types of mobile loading equipment.



The wide 54" carrier belt is powered by a 150 h.p. engine and has a peak capacity of one ton per second. Diagonal mounting of the conveyor and high clearance of the delivery chute makes possible the loading of large hauling units in cuts as narrow as 32 feet shoulder to shoulder. Unusually long belt life is achieved by an effective cleaning mechanism and complete belt protection along the edges and at the cutting blade — material being loaded slides up the cutting edge and onto the belt rather than striking against it.

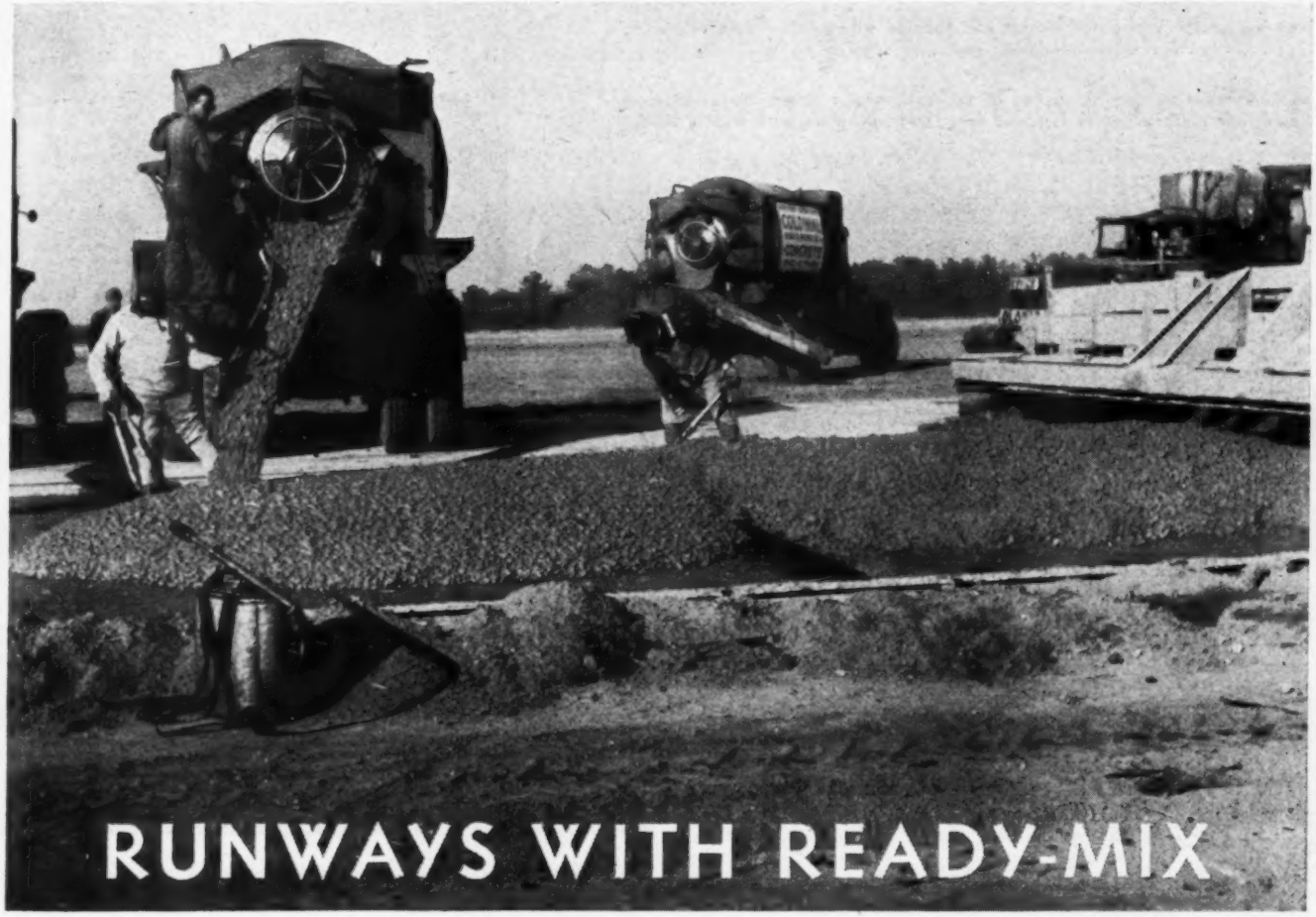
Write us or your nearest Euclid distributor for descriptive literature and specifications on this efficient earth loading unit.

The EUCLID ROAD MACHINERY Co.
CLEVELAND, OHIO

EUCLID SELF-POWERED HAULING EQUIPMENT
For EARTH ROCK COAL ORE

ROADS AND STREETS

January, 1944, Vol. 87, No. 1



RUNWAYS WITH READY-MIX

Eight to eleven 7½-yd. truck mixers helped place up to 4,200 sq. yd. of pavement per 8-hour shift on CAA airport in New Jersey

FACED with a shortage of batch trucks, drivers and paver operators, and not having a paver handy, the contracting firm of Grandview Company of Mt. Vernon, N. Y., turned to truck mixers for the 135,000 sq. yd. of runway concrete needed in a hurry at the new Woodbine, New Jersey, airport.

This is a typical small field for medium planes, consisting of a triangular layout of three runways, each 150 x 2,500 ft., a 50 x 2,500 ft. taxi strip and parking apron. An auxiliary field built for the Navy, it is located ten miles inland from Atlantic City near the small community of Woodbine.

Notes on Ready-Mix

Hence the contractor had an "out in the country" situation to deal with, rather than one within economic hauling distance of an established urban ready-mix plant. The choice of ready-mixed concrete was influenced by the above factors, plus the ready availability of a fleet of 7½-cu. yd. truck mixers. From 8 to 11 machines were used. Hauls varied from 4,000 to 8,000 ft. from a batching and bulk cement plant located at a rail siding a third of a mile from the nearest part of the job. The mixer trucks, with their big capacity, took the place of a larger number of ordinary dump trucks, which were scarce articles in many parts of the East this past fall. Hence fewer drivers had to be found,

Earth moving on the Woodbine airport was handled with relative ease, thanks to perfect autumn weather and a sand-gravelly soil

(Below) Finegrader moving along one of the final runway strips. Note looseness of the subgrade material, which required very thorough rolling with smooth rollers.

However, there was some soft going. Note tell-tale "spore" of scraper which required a little bucking to load without a pusher

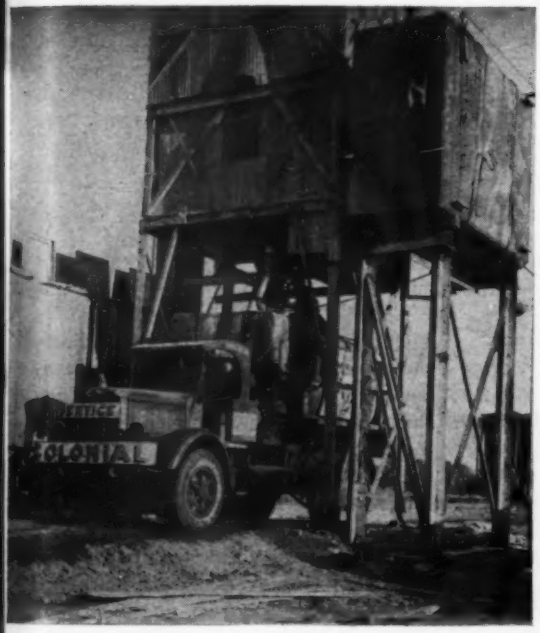
The finishing procession consisted of a mechanical spreader, finisher, longitudinal float, joint machine and belts

(Below) Showing trucks unloading across concrete apron paved several days previous. Ready-mix trucks placed about 4,000 sq. yd. of pavement per 8-hour day with minimum labor

Ready-mix trucks were first loaded with the proportioned dry aggregates, then with cement and water at an adjoining bulk cement plant

The power end of a wagon scraper, plus a bent I-beam, solved the problem of a high-speed drag to mulch for seeding. (Below) Bulk cement plant and metered tank for batch water. A semi-portable diesel electric generator furnished current for batching and bulk cement plant operation

Wet canvas protected this motor from dust and weather. Power drive for the bulk cement elevator



(Below) The Grandview Company is another contracting outfit that goes the limit on modern greasing routine. A daily service record is turned in for every unit

and the contractor also saved a couple of paver men and eliminated a fleet of water trucks and their drivers.

According to the resident engineer, ready-mixed concrete presented no special finishing problem, but rather its use permitted close accuracy in water control at the plant. At no time did the contractor use the maximum gallonage permitted per batch. The absence of cement loss on windy days, and blowing of cement dust over workers, were also mentioned as favorable factors.

1,500 ft. Per Day

The runways consisted of 7-in. uniform concrete, placed in 25-ft. lanes with keyed longitudinal joints and doweled expansion joints (¾-in. non-extending impregnated fibre) every 100 ft. About 1,500 lin-ft. of pavement strip per 8-hour day was placed and finished by keeping at least two and sometimes more mix trucks always in dumping position ahead of the spreader. High-early-strength cement was used to enable the finishing equipment to ride the slab edge and place adjacent lanes with less delay for hardening.

Runways were paved in adjacent strips, starting at the centerline and working toward the edge, rather than in alternate lanes, using steel forms for the outer side only. Mixer trucks backed into dumping position from the unpaved side except in a special last-of-the-project situation (shown in the photos) where trucks had to back across a paved strip.

Concrete of a fairly stiff consistency (3-in. max. slump) was employed, the mix being controlled with extra vigilance to insure against any possible segregation in spouting. The two or three concrete spreaders aided the drivers in adjusting, positioning and taking up the chutes.

Finishing equipment consisted of a mechanical spreader, finisher, longitudinal float, dummy joint machine, wooden bridge for troweling joints, and two muslin finishing belts. A 2-man wooden screed or float took the place of one of the belts at times. Colorless membrane curing was used.

Other paving and subgrading finishing equipment on this job included a

Blowing joints clean and sealing joints with help of compressed air

Harry Simberg, resident engineer, and F. W. Taylor, from another nearby CAA airport project, snapped while going over the Woodbine job

motor grader, mechanical form tamper, two vibrators fastened on the spreader, finegrader, 8-ton roller, and two subgrade sprinkler tracks (one a converted asphalt distributor). One crawler crane and one truck crane served the batch bin. The latter crane was used to snag material cars into position by running alongside in low gear with a tow rope. Another truck crane was used to move concrete equipment from one lane to another.

Joints in the finished slab were blown clean with a special blowing tool served by a small portable compressor, and sealed with an ordinary sprinkling can equipped with a small spout opening.

Notes on Grading

Grading involved excavation of 312,000 cu. yd. of easily handled and compacted sand-gravel material from a high area in the center of the field. Two runways were in cut at midpoint and in fills of 3 to 10 ft. in depth at the ends. The third runway was on shallow fill throughout.

Grading and compaction was handled by an outfit consisting of 6 Euclids, 3 Tournapulls, 6 12-yd. scraper units, 3 shovels (in heaviest cut areas, loading to trucks and Euclids, 3 motor graders, 2 10-ton smooth rollers, 2 sheepsfoot rollers (2 drum), 5 dozers, 2 sprinklers, 10 trucks. One of the Euclid power units was used to tow a U-shaped I-beam drag to level and trim the field. Shallow ditches paralleling two of the runways along the outer shoulders were shaped by scrapers, and scrapers and dozers were used to cut wide, open drainage ditches. The simple system of field underdrains and inlets were installed with the help of a backhoe.

The Woodbine Airport represents an example of the economy that comes with nearly ideal site conditions. The entire contract consideration, including rather heavy clearing and grubbing and burning of 235 acres of scrub trees, was $489,707. The entire job was completed between Sept. 8 and Dec. 10, the runway paving being let Oct. 18.

The first portion of the job was slowed by unusually dry weather which necessitated extra sprinkling to obtain grade compaction. Soil compaction tests were made daily. In later weeks rainstorms required the contractor to remove and backfill wet subgrade, to maintain his schedule. Since grading and paving were under one contract, there was no hitch in "borrowing" grading equipment to help ahead of the paver.

Grandview Company, Mt. Vernon, N. Y., the contractors, were represented on the job by Domineck and James Mirabelli, firm members, and by L. Brumagin and R. J. Cerrone, superintendents, and Ray Walters in charge of equipment. Colonial Sand and Gravel Company, New York City, delivered concrete to the subgrade. Harry Simberg was resident engineer and G. Secor, assistant, for the Civil Aeronautics Administration, contracting agency, this field being designed and supervised by the CAA's Airways Engineering Branch, Eastern Region, LaGuardia Field, New York. James Mirabelli, member of firm, left in the final stages of project to accept a commission with the U. S. Army Engineers.

AASHO-AGC Joint Committee

The Joint Cooperative Committee of the American Association of State Highway Officials and the Associated General Contractors of America, Inc., met in Chicago recently to discuss ways and means of expediting surveys, plans and the acquisition of rights-of-way for post-war highway projects.

Chairman Hopkins presided. The full committee membership was present as follows:

A.A.S.H.O.—H. K. Bishop, P.R.A.; C. M. Hathaway, Ill.; W. W. Mack, Del; E. L. Roettiger, Wis.

A.G.C.—Richard Hopkins, N. Y.; F. C. Nelch, Ill.; W. P. Roscoe, Mont.; D. W. Winkelman, N. Y.

Harry J. Kirk is secretary. Among guests were S. C. Hadden of Indiana, First V. P., A.A.S.H.O., and the President, Vice-President and Managing Director of the A.G.C., which was simultaneously holding a meeting of its governing board. (*See Board review, November R. & S.*)

The following are the principal points brought out in this meeting:

Engineers in War Work

Many highway engineers have gone into the armed services, and many have accepted jobs on war construction work at salaries considerably in excess of what they have been formerly receiving. One contractor present said that he had employed about two dozen such men. Two-thirds of these have now gone into other fields, and it would appear that many will be slow to return to their old employment. State highway engineering field and designing forces are only 40% to 50% of 1940 and 1941. Some engineers are coming back; but many are disinclined to return due to low salary schedules.

Use of Private Firms

In the past state highway departments have customarily handled their surveys and plans with their own forces, and seldom have made use of the services of private engineering firms. Nevertheless, in the experience of those present, where such firms have been employed, the results have been satisfactory. It was agreed that under the present circumstances it would be well to give consideration to expanding the use of available private engineering firms, especially on plans for counties and municipalities.

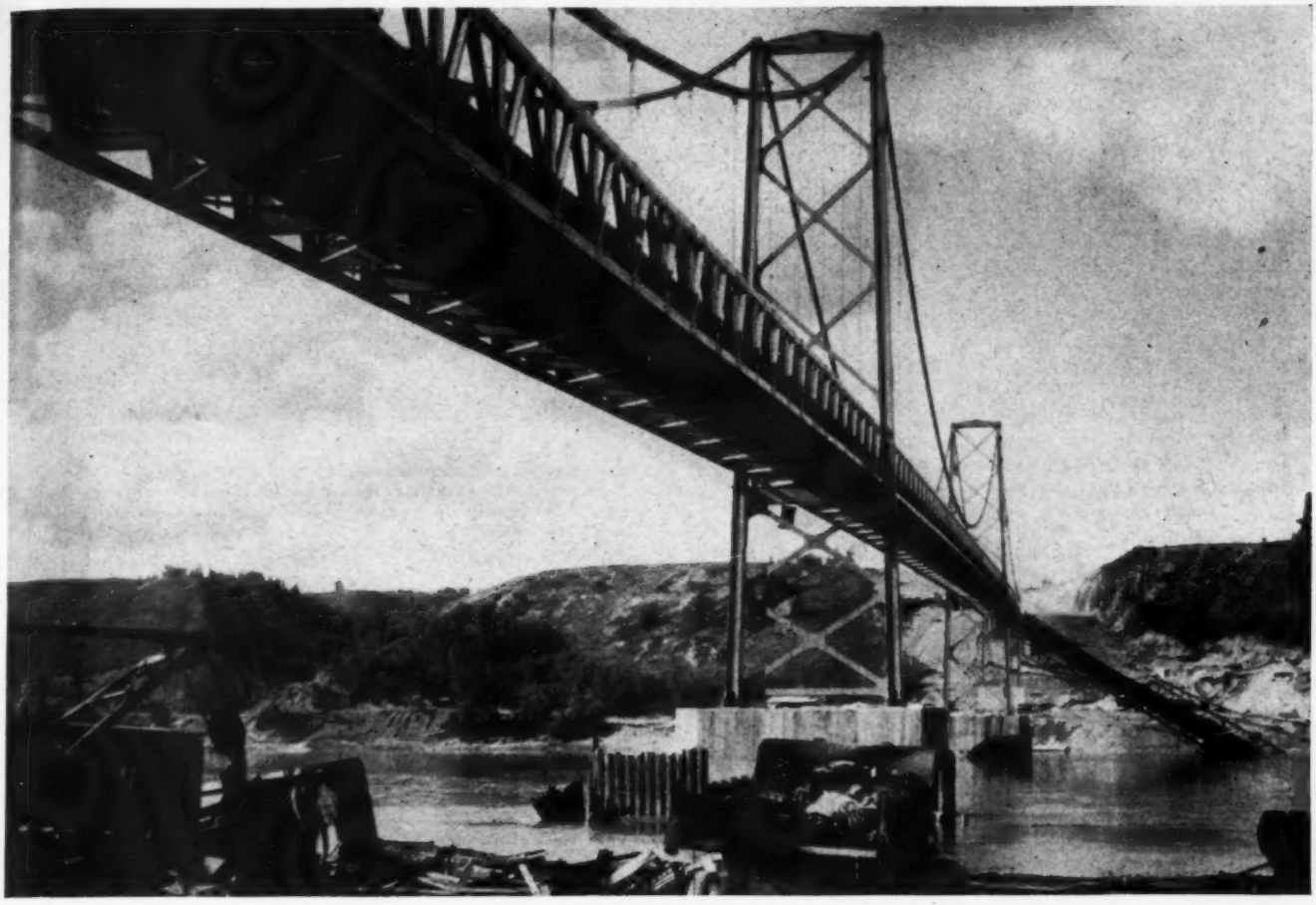
On many war construction projects the contractor was required to organize his own engineering force. Thus there have been assembled engineering organizations that might well be used to prepare plans for post-war highway projects, and this might help meet the problem faced in some states where salaries, permitted by law for engineers employed directly, are not high enough to attract qualified men.

The Public Roads Administration will approve, under certain conditions, the expenditure of federal aid highway planning funds for the employment of private engineering firms.

Status of Plans Now Ready

If hostilities should end soon, many depleted highway departments would be unprepared to launch an accelerated construction program without many months' delay. The P.R.A. is now collecting data to determine the shelf of plans available for post-war highway projects which accumulated before W.P.B. stopped construction.

In some states the acquisition of needed rights-of-way is still a very slow process. This is because of antiquated legal machinery. The only remedy is legislative action in the various states where it would be advisable to follow the example of those states where procedure of right-of-way acquisition has been streamlined.



Roads and Streets photo

Largest of the steel bridges on the 1943 Alaska Highway program is the Peace River suspension bridge

Bridges on the Alaska Highway

Fifty-five permanent bridges and many re-built temporary structures formed a major part of the 1943 construction program on this road.

By HAROLD J. McKEEVER
Editor, Roads and Streets

THE Alaska Military Highway crosses 106 sites important enough to warrant engineering design and supervision of bridges. Seventeen of these crossings are in Alaska. Nearly all waterways were spanned the first year with temporary structures (mostly trestles). At the Nisutlin, Teslin, McClintock and Lewes rivers 12 ft. single lane structures were completed late in 1942 but not replaced last year.

The plan at the close of 1942 was to replace all temporary bridges, but the magnitude of the job was such that compromise proved necessary. Actually about 140 new bridges were scheduled for completion by the end of 1943. Of these, 55 are permanent types including 12 I-beam, 20 steel truss, 8 timber truss, one plate girder, and 2 suspension type. The few projects not already completed in this $14,000,000 program are being rushed in a race against winter.

The permanent bridges total 4½ miles in length. All are of two-lane construction, with 24-ft. roadways designed under AASHO standards for H-20 loading.

First Designed for Timber

Most of the larger permanent bridges were first designed as timber spans, including some of record size. However, the turn of events made timber harder and steel easier to obtain and fabricate, and a good many were redesigned. To reduce drafting room time and simplify fabrication, standard "Sears Roebuck" designs were worked up for common span lengths, including 40, 50 and 60-ft. I-beams and 100, 200 and 250-ft. truss spans. Trestles are mostly untreated 19-ft. panels with 6 x 18-in. or heavier stringers. Timber trusses are designed with splices at every panel, to utilize short timbers and thus simplify procurement as well as delivery.

A big bridge problem was transportation. Steel fabricated sections up to 80 ft. long, heavy timbers, derricks, pile drivers, etc., had to be shipped from the states to points of access, then moved up the road, sometimes for five or six hundred miles. Bridges on the Dowell Construction Co.'s 480 mile section alone required an estimated 1,650,000 miles of truck haul (5,000 truck trips) for completion in the period from July onward. Fifty-five ton loads were snagged over the raw subgrade.

Ice and Floods Scored Many Washouts

However, in contrast with the first year's hand methods and makeshift equipment, the bridge outfits were generally well provided with modern cranes, drivers, pumps and other units, and normal engineering and construction procedure was everywhere in evidence.

From the first ice trouble in November, '42, through to mid-summer, 57

Photos Public Roads Admin.
Sikanni Chief bridge—assembled section of a treated timber span being lowered into position. Pederson Const. Co.

Sikanni Chief bridge—three 144-ft. K-truss spans of treated timber. Shown is first convoy to cross the bridge on completion April 25, 1943 (Photo by Geo. M. Shepard of Okes Construction Co.)

bridges suffered a total of 87 washouts, not counting minor breaks soon repaired or losses of small drainage structures. Of these, 21 were due to ice and the rest to high water or drift. Sixteen bridges went out more than once, some cracking up five or six times. Washouts and how they were handled will be touched on in the following case notes on selected bridges.

Kiskatinaw, first major bridge on the southern end, includes the longest single timber span. Built on a 9-degree curve to reduce approach excavation, it crosses the canyon with a main 192-ft. deck truss, two 114-ft. truss spans and several trestle panels. Trusses include steel gusset plates and 4-in. ring connectors. Main trusses rest on timber towers supported on concrete piers. Flooring consisted of 2 x 6-in. native spruce, bath-treated with waterborne salt preservative at the site.

Construction began late in 1942, concrete piers being placed with aggregates heated through a one-inch perforated steam pipe. Cold weather was a serious obstacle. At times it was almost impossible to wash the aggregates, and much difficulty was experienced in preventing freezing in the footing excavations.

Heavy, Falsework in Winter

Feature of this job was the heavy falsework, built in winter. Falsework for the main span rested on four rockfilled log cribs 30 x 20 ft., spaced to give 20-ft. clear waterways.

Truss members were fabricated at North Vancouver and delivered to trucks at the Dawson Creek railhead near the bridge. Timber erection for the first tower began on March 18, timbers being lowered into position from the false work deck by a gin pole equipped with manually operated winches. There were several snow storms during erection, and it was a problem to remove snow and ice from bolt holes and connector grooves.

In April, high water took out the detour bridge and a large part of the falsework, greatly slowing the job and necessitating driving new piling into frozen ground. Steel pile shoes and steam jetting aided in this task. Creosoted piles were driven 3 to 20 ft. to refusal with a double acting steam hammer. Falsework was restored and the trusses erected by early June with a traveler and block and tackle. Four sets of tackle and one steel cable operated with a hand winch were required to set the four 10" x 24" x 48-ft. top chord members.

R. P. Agnew, highway engineer, and John B. Kiely, associate highway engineer, of the PRA, who served successively as resident engineers, are authors of a report from which the above brief outline was taken. Don Construction Limited of Toronto was the contractor.

Big Timber Trusses

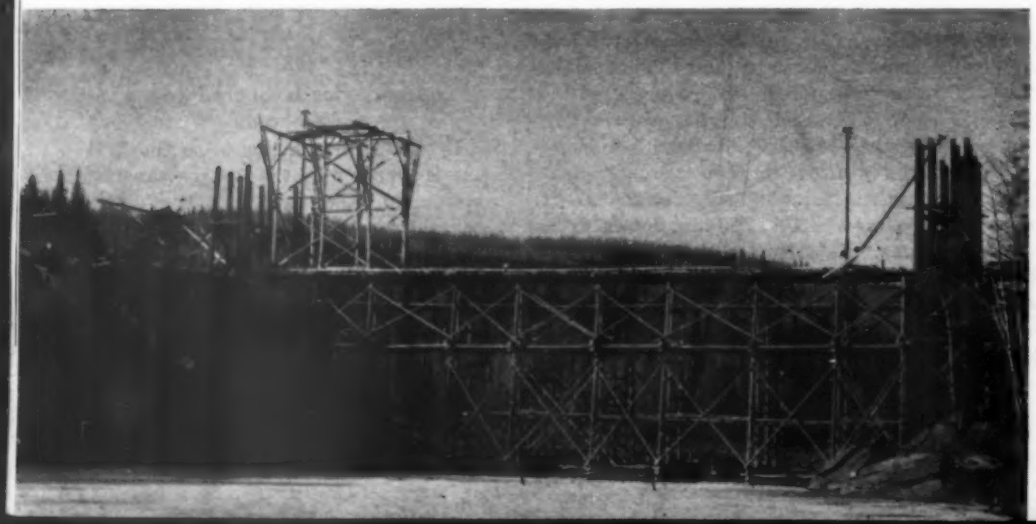
Sikanni Chief—Among the large timber truss bridges are those at the Kiskatinaw (Cut Bank) and the Sikanni Chief rivers near the southern end. Each consists of three 144-ft. deck-truss spans on crib piers, crossing from high banks in order to clear flood, drift and ice.

According to a report by S. W. Powell, PRA resident engineer, the Sikanni site was investigated by means of four borings and two test piles.

Split ring connectors were used in framing. Fir timber imported from the U. S. was treated with 50-50 creo-

Elaborate falsework for the Kiskatinaw River bridge, April 7, 1943 (later washed out). Falsework rested on four rock-filled cribs each 20 x 30 ft.

Bridge consits of one 195-ft. and two 114-ft. treated timber deck-truss spans with timber trestle approaches. Roadway is on a curve. Don Construction of Toronto, contractor.
Photo Public Roads Admin.



Photos Public Roads Admin.

Muskwa bridge, as seen on April 9, 1943 (still sub-zero!). Steel for these spans was reclaimed from a Southern Pacific R. R. bridge—dismantled due to backwater of Shasta Dam in California. Note canvas concrete protection

sote and petroleum oil before shipment. Two 16-pile bank piers and two 25-pile main piers were driven with native spruce piles treated with a water-borne salt preservative at rate of 21 lb. per M.B.F. Cold weather which struck last fall midpoint in the pile driving, necessitated heating piles before peeling and treating under shelter. Tests on treated piles last spring showed satisfactory (¾-in.) penetration of sodium flouride. Blasting of frozen ground was necessary to start driving piles after sub-zero weather set in.

Material Trucked Long Distance

Bridge material was trucked 164 miles from the rail head at Dawson Creek. Erection was delayed many weeks by a "lost" carload of structural members, which finally arrived March 16. The original scheme of fabricating half-truss sections on ice and raising had to be changed due to lack of a large enough crane. The job was eventally handled by adding a 330-lb. counterweight to the crane, fabricating a quarter-span at a time on skids, dragging it over the ice and lifting to position on the falsework. Seats for the ring connectors did not always coincide, and jacks, turnbuckles and hoists were used to produce matching of members. The pony bent falsework was built low enough to permit use of wedges to adjust sections for camber. A 22-ton crane handled floor beams and stringers.

Native timber decking was dipped in salt preservative and a second treatment mopped on to get a somewhat disappointing penetration.

The Sikanni bridge was completed April 25, the superstructure having taken 32 days. The three spans, totaling 585-ft. required 491,824 lb. of treated fir timber and 76,660-lb. of hardware. Pederson Brothers, Inc., of Mintevidio, Minn., had the contract.

Nisutlin Bay — Longest timber structure on the highway, this bridge was completed last winter as a 93-bent trestle-type bridge 2,325 ft. long. It utilized piles up to 70 ft. in length for pony bents, some piles requiring splicing and many being driven through holes in the ice. The 8 x 22-in. deck timbers were imported from the U. S. via Skagway.

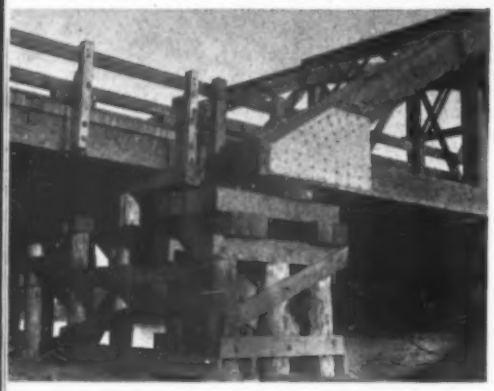
Although bents were driven for two lanes, only a single lane was in service all through the 1943 season. A bascule span is planned for this structure,* since the waterway, an arm of a drowned river valley, is classed as navigable. The Army forces began one end, the contractor the other, using ordinary steam pile driving equipment and setting deck with truck cranes. Angeles Gravel & Supply Co., contractor.

Takhini—Located a few miles west of Whitehorse, this bridge consists of two 160-ft. bowstring treated timber ring-connected trusses. It was erected this spring and summer on heavy crib piers equipped with exceptionally heavy timber ice noses. In spite of a 13½-ft. rise in the stream, the center cofferdam was successfully set 18 ft. below the surface and a 9 x 45 ft. pier completed in two weeks, using a mobile crane.

*Article, "Timber Bascule Spans a Feature of Alcan Bridges," appearing in February, 1943, *Roads and Streets*, describes a lift span then contemplated for this structure. At this writing final design of the span hasn't been announced.—Editor.

Muskwa River bridge near Fort Nelson, shown soon after completion in July, 1943. Note drift against piers (George Shepard photo)

Dezadeash River bridge on the Haines spur road west of Whitehorse, consists of a single 160-ft. treated timber bowstring truss



The Dezadeash bridge, showing details of heavy timber framing (see article)

Built Truss Before Pier

The center pier work was held up waiting on sheathing, and in this interval all but one panel of one truss was run out on falsework. Including connectors and shield plate connections a total of 2,780 pieces for 197 designated structural members had to be assembled for the two spans. Bates and Rogers of Chicago was the contractor.

Dezadeash—This single 160-ft. timber bowstring, on the Haines Road near its junction with the Alaska Highway, is of interest for design adaptation made after the start of fabrication. Originally planned as a steel truss, its heavy timber framing is designed to fit the pier location and utilize the already-fabricated gusset plates and steel floor beams. Angeles Gravel & Supply Co., contractor.

Glacial Streams

Duke—The Duke River, the first of the shallow, glaciating streams encountered, was originally slated for seven 200-ft. steel trusses on concrete piers. Instead, reflecting policy change, it was re-crossed with a conventional temporary trestle. Piles couldn't be driven because of boulders in the bed. After clearing the site of surface boulders, with a dozer where in the dry, framed bents were set 9 ft. below the bottom, using a dragline to excavate, set bents and backfill. Deck lumber for the 75 panels was manufactured at Whitehorse 170 miles away. Bates and Rogers, contractors.

(The Duke River bridge washed out last spring and was forded all summer. Army freighters went through unaided but the Utah Construction Company had to keep a tandem grader on hand to snatch lighter vehicles. This stream's summertime habit is to rise daily from 2 p. m. until midnight, then subside.)

Donjek—Here is a tricky stream, which iced up badly last winter, catching trucks fast, and which took out part of the Army's trestle in the spring. Original plans: Eight 200-ft. steel spans. As built: 85-panel semi-permanent timber trestle, parallel to the original bridge.

Of interest is the effort to keep the Army's trestle across this 2-mile-wide glacial flat from going out. It survived floods, but only through quick work on the part of Utah construction men, who anchored the end cribbing and some of the piers to the banks with wire rope. A "cherry picker" (vertical-post crane on truck) went across daily or oftener, picking driftwood from the upstream side and setting it over on the downstream side.

Steel Bridges Include Notable Structures

Peace—Largest of the Alaska Road bridges is the suspension span across the Peace River near the southern end. Today a 2130-ft. structure, including a 930-ft. center span, carries traffic uneventfully across this stream, which was the source of untold grief and delay and difficulty to the road builders from the start.

Last year the Peace River ferry was a serious bottleneck all season until a temporary trestle was erected in October. The trestle failed partially from ice pressure in November and again later, and finally washed out completely, making ferry service necessary again this summer.

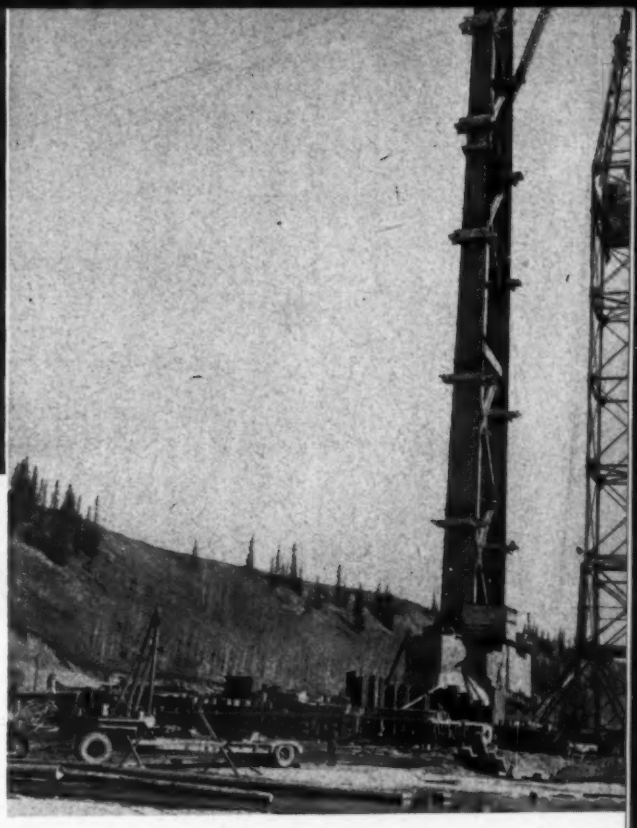
The Peace is a swift stream, with a flow exceeded by only a few North American streams. Ice at the bridge site attains a thickness of 4 ft., and has a habit of "going" out in pieces as large as 700 by 2,000 ft., which no bridge could withstand. This condition, combined with the necessity for a deep foundation, dictated a suspension span, which was built without falsework. Two deck trusses of 135-ft. span were interposed between the cable bents and the anchorage.

As noted in a summary by Raymond Archbald, PRA Principal Structural Engineer, the concrete-floored,

Commissioner Thos. H. MacDonald of Public Roads Administration (leather jacket) with men who aided on Peace River bridge: Raymond Archibald, principal structural engineer; R. P. Tipton, senior structural engineer, C. J. Corrigan, highway resident engineer

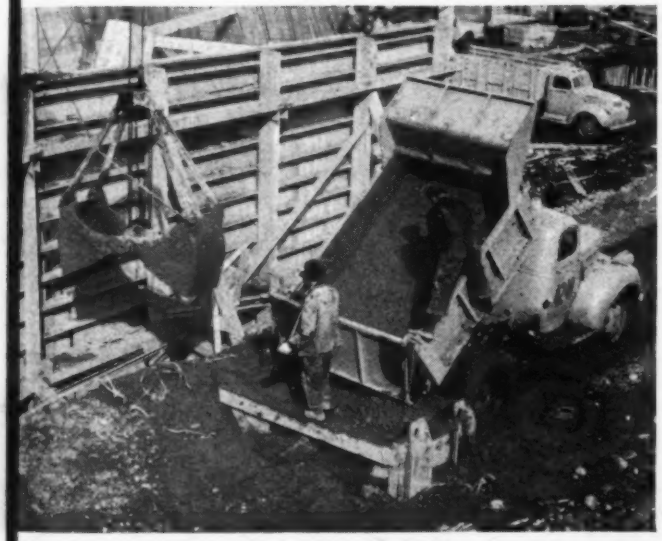
Fig. 1—Suspension bridge across the Peace River near southern end of the Alaska Highway

Clamshell in upper right is back-filling, while crane removes forms from north anchor



(Right) During dismantling of the erection tower. Mast which formerly swung from upper part of tower is shown set over into the permanent tower

Peace River Bridge



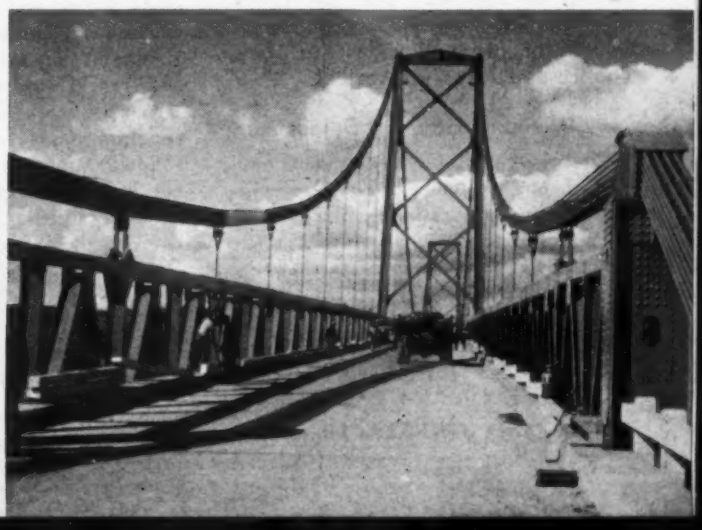
Dumping into a cement box during concreting of south anchor

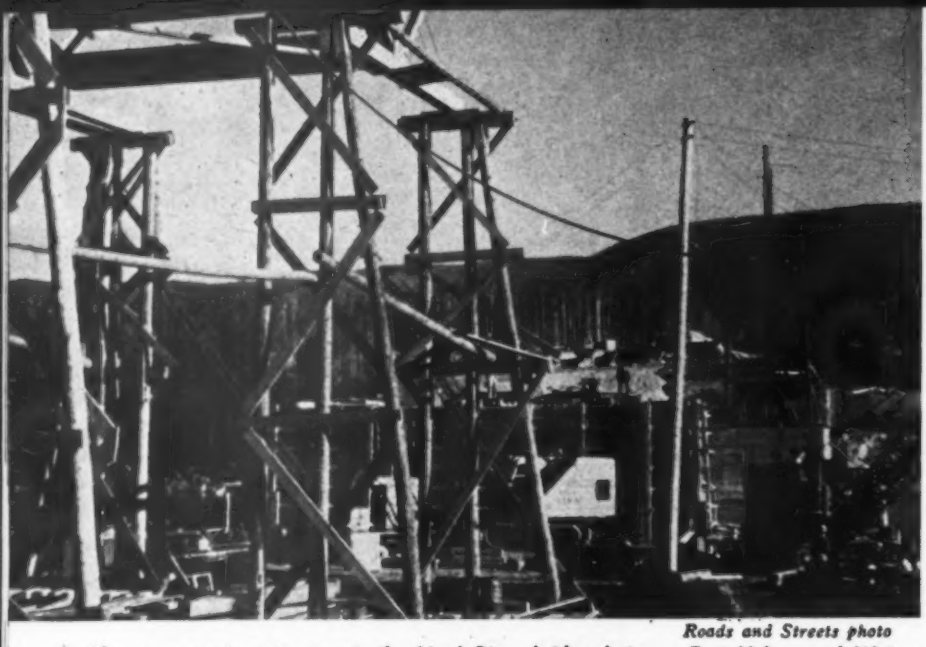
Photo Public Roads Admin.

A wide ramp was necessary around north pier to give access to erection tower set up and operated on skids on the ice

South anchor of Peace bridge, giving idea of size of this structure. (Right below): Note details of suspension cable, which runs over steel pier column and through 135-ft. side span to anchorage

Roads and Streets photos





Roads and Streets photo

Also a suspension structure is the Liard River bridge between Fort Nelson and Watson Lake. The river span is 542 ft. long. This view shows stiffening truss for one anchor span being erected on timber falsework

Photo Public Roads Admin.

Specially mounted mobile cranes performed important service on Alcan bridges in 1943

2-lane deck is suspended from two open-type parallel-strand cables, each consisting of twenty 2 1/16 in. strands, held in position with cable clamps at hangers and saddles.

Of interest also is the erection of 196-ft. main towers with a 250-ft. erection tower working on the ice. This tower, being guyed back, could not swing its load and the loads had to be "spotted" by skidding the rig around on the ice. The last tower was completed April 9 and the erection outfit dismantled just in time. The ice started to go April 15.

Winter Concreting Details

The concrete foundations were carried through during the severe winter, the main piers being placed with all possible speed in order to get the steel towers up before the spring break-up. Pier excavation went 50 ft. below the water line into shale and concrete was placed in the dry, using steel sheeting. Preheating of aggregates and other precautions were taken in placing the 4,000 cu. yd. of concrete contained in each pier.

The concreting of the anchorages was coordinated so as to have the cable anchorage steel in place by the time the cables were strung. Each anchorage contains about 7,500 cu. yd. of concrete so placed as to form cells that were filled with gravel. Large segmented blocks of concrete, keyed and interlocked, were poured.

Concreting in 50-below weather produced its problems. Stone was heated so hot at times that no heating of water was required. Some aggregates had to be stockpiled to cool.

John A. Roebling's Sons Company of Trenton, New Jersey, was contractor for steel and erection of superstructure, and Dufferin Paving Company of Toronto built the foundations. Construction estimate, $2,500,000.

Liard Suspension Bridge

Liard—Exceeded only by the Peace River bridge in estimated cost ($1,000,000) this bridge consists of a single suspension span of 542 ft., with 232-ft. anchor spans. Two washouts on this large MacKenzie tributary made the necessity of such a structure evident. The bridge comprises two 12-strand open-type cables carried over steel towers, with stiffening strusses of conventional design. Original plans called for a concrete roadway, but 2 x 8-in. laminated timber (untreated spruce) was substituted, necessitating changes in the camber details to account for the lighter weight.

Both anchorages and one tower pier rest on gravel, and one pier on rock. In constructing the latter (north) pier, steel sheeting couldn't be driven and a rock-filled timber crib was used. After the footing seal was concreted, April ice damaged this crib and flood water topped it before repairs could be completed. To save time the pier shaft was tremied to the water line (360 cu. yd. of concrete). But not until inexperienced divers had finally removed mud and silt with the aid of jets and suction pumps.

Double Cofferdam

The south pier also presented difficulties. Boulders hampered cofferdam construction. The 38-ft. steel sheeting brought in for this job was partly driven, when it became advisable to put the sheeting 10 ft. lower, which took it below the water line. A second, outside line of sheeting was then driven entirely around, to less depth. However, water got under the first line and over the second, flooding the pit and necessitating the use of eight 6 and 8-in. centrifugal pumps to dewater long enough to tremie the footing and dry-pour the shaft.

Steel for the 93-ft. towers was erected with a 110-ft. guy derrick. Anchor span stiffeners were erected on falsework (over dry banks) using crawler cranes. A wartime note was lent by one crane, whose steel boom was extended 10 ft. by means of a 12 x 12 timber spliced on with wire rope.

Early in the season, when the temporary bridge had washed out, army trucks were taken across at this site with a high-line cableway. A heavy-duty barge, operating on a low-line cable trolley, moved construction equipment and supplies from shore to shore, during construction. Suspension cables were hoisted over the saddles with the tower derricks, and stiffening trusses set in 38-ft. panels from another high-line.

Concrete for piers and anchorages was mixed in a modern 1-yd. concreting plant which was moved 7 miles from one shore to the other via a new temporary trestle downstream. The crawler cranes also walked this trip. Concrete was taken to the unloading point in ready-mix trucks and either chuted directly into place or into con-

Talking it over at the upper Liard bridge—C. G. Norris, resident engineer on adjoining highway work under McVaugh-Haynes, John Zoss, resident on the bridge, and PRA supervisor R. D. Walton

Roads and Streets photo

The Liard is again crossed north of Watson Lake by a cantilever steel truss continuous over two spans. Total length 460 ft. At right is the 1943 temporary trestle, in center is erection falsework with service deck. Enclosed hoist engine is engaged in setting center-pier cofferdam

On upper Liard falsework in early spring. Stoking fire to keep compressor lines from freezing

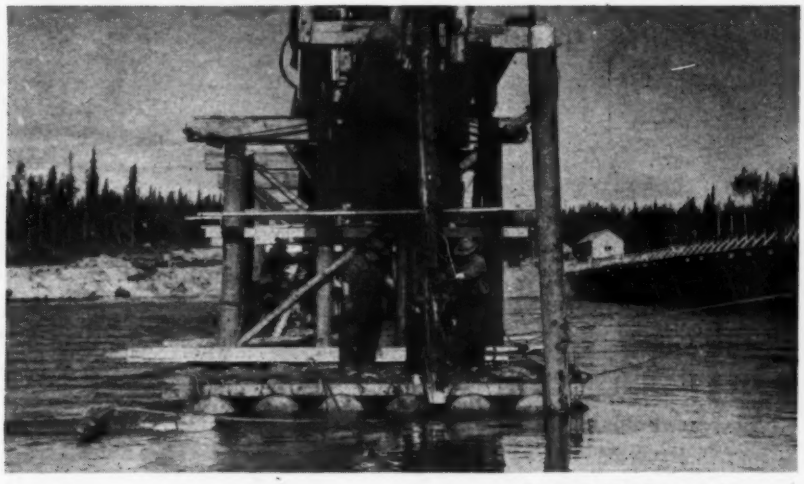


Photo Public Roads Admin.

Driving falsework for erection trestle, upper Liard crossing. Note men standing on raft which is floated on empty gas drums and anchored against current from temporary trestle at right

Pneumatic pile extractor and jet combined were required to get out this sheeting—upper Liard River bridge

Extracting sheet piling from the Liard river bed gravel kept three compressor unit lugging

Roads and Streets photo

Pinkstaff-PRA photo

Glacial stream (White River) in Yukon, showing 2-mile-wide flat across which Bates and Rogers of Chicago had contract for erecting a permanent steel and concrete bridge

As a New Year's present to your Editor came this photo from men at Utah Construction Co. Camp 6 over 250 miles northwest of Whitehorse, Yukon. Taken Nov. 15 during ceremony of "closing the last gap" of Alcan as an all-year road. Accompanying letter, signed by four of the shop staff, said "Thanks for the R & S copies containing your article... it seems to be a very accurate account of the work on this stretch of the road."

crete buckets. Over 62,000 sacks of cement had to be trucked more than 500 miles up the highway for this bridge.

McNamara Construction Company of Toronto was contractor for the substructure and American Bridge Company, Ltd., for the steel and erection.

Upper Liard—A second bridge over the Liard, west of Watson Lake, consisted of a two-span continuous cantilever steel truss on concrete pier and abutments. Span lengths are 230 ft. Steel for this bridge was erected on falsework which was plank floored as a service bridge. Here, too, much difficulty was had with sheeting, particularly in extracting. The first or corner sheeting to be pulled in one instance took 35 minutes of pulling with combined effort of an air extractor, blocks and jet. The timber crib for the center pier was settled to good footing with the help of a drop hammer and eight 8,000-lb. sand boxes. Bates and Rogers had this job.

Assembling nestible corrugated pipe, mile-182 up the highway

Northern Streams Steel Trusses

Costing from $250,000 to $850,000 each, bridges over several of the largest northern glacial streams are under construction this fall with massive concrete piers and steel trusses located high above ice. Involving few design novelties, but plenty of construction problems, these include the White River bridge, and multiple steel truss crossings over the Tanana, Tok, Robertson and Big Gerstle rivers in Alaska.

The White River bridge will consist of two 250-ft. steel through-truss spans on concrete piers, with one 50-ft. I-beam and one timber trestle approach panel. The deck will be 30 ft. above water, the central piers 45 and 55 ft. high with 20 x 63 and 15 x 50 ft. spread footings respectively.

The Robertson bridge, involving seven 200-ft. steel deck trusses, will be perhaps the third costliest bridge on the highway, requiring 2,646,000 lb. of structural steel. The temporary bridge here went out three times from ice and once from flood. Ice built up to a height of more than fifty feet above the normal stream level last winter, swallowing up the temporary 272-ft. trestle to a depth of 10 ft. New steel is 70 ft. above the bed.

Culverts in Great Variety

Hundreds of the Army's improvised log culverts were replaced with stronger more durable structures. Nestible corrugated metal pipe was assembled into culvert lengths at line camps and installed with the help of dragline and backfilling dozer. Metal-clamped treated-wood stave pipe, shipped knocked down, was put together on the site. Spirally-reinforced treated and dipped wood pipe was also employed. Pipe culverts ranged from 12 to 48 in. in diameter.

Treated timber boxes of conventional Western U. S. design were installed for 4 x 4 and 6 x 6 ft. openings and trestle panel for larger openings. The total number of drainage installations was greatly increased over last year, involving some 75 miles of new culverts. This fact, plus re-opening of outlets, correction of culvert locations, better ditching, and in some cases better road location, make the 1943-model road a vastly improved one.

Big Road Upkeep Job Ahead in '44

Photo courtesy Ohio Dept. of Highways

Heavy coal hauling plus wet weather played havoc with this secondary road

AS we enter the third war year, how are our roads faring? Have they retrograded under heavy wartime trucking, in spite of their preservation in 1943? What mileage of various types will likely need special maintenance in the year ahead? Heavy repairs? Resurfacing? Entire reconstruction as a military necessity? What methods will be employed? How entensively will contractors figure in this work? What about funds? Manpower, equipment, other problems?

The editors of ROADS AND STREETS recently asked these questions of state highway leaders. Excerpts from some of their replies are as follows. Additional replies will be published in the February issue:

Ohio Plans $13,000,000 Upkeep

Reports H. G. Sours, Ohio Director of Highways:

From the overall view-point in Ohio the road conditions, at least temporarily, are good. Reasonable service to the highway users has not been curtailed. This has demanded a vigilant policy of maintenance not only on the main roads but also on the secondary system where the reduced maintenance has been sufficient to properly accommodate the reduced traffic. This maintenance is beyond the usual and is generally more costly than could normally be justified.

It is a well known fact that our main or arterial system of roads has taken a terrific pounding. The resultant deterioration is practically immeasurable. Generally, it is agreed that the arterial system, to be consistent with up-to-date standards of construction and design, has been set back quite a number of years. This means that many roads will, before long, rapidly go to pieces, requiring complete new construction. The stoppage of the normal program due to the war also means that there is an accumulation of needed new construction projects. However by base and surface patching, surface treatments, resurfacing and stabilization of berms, the bulk of the main roads have been kept in a condition that will adequately handle the traffic.

As to accumulated maintenance and repair need it should be pointed out that only the most essential maintenance demands have been met. They are bases, surfaces, structures and edges on narrow pavements.

$500,000 Carried Over

In 1943 our engineers estimated a need for about $6,000,000 worth of surface treatments on our total Ohio State mileage. For this work there was available $3,875,000. Naturally, the treatments were programmed on the main system first, with roads of 2nd, 3rd, 4th and 5th priority classification being financed as funds permitted. Roads not surface-treated were patched out, thus providing service to the highway users and also protecting, as far as possible, the highway investment. It is interesting to note that, of the $3,875,000 programmed, $500,000 was not expended. This was the result of material restrictions, transportation difficulties and labor and equipment shortages.

In 1943 $275,000 was expended in repair of structures, of $400,000 programmed.

Our Planning Bureau informs us that there is needed 90 miles of heavy repairs; 550 miles of bituminous concrete resurfacing; 2,800 miles of surface treatments, both skin and road-mix; and about 8 miles to be constructed as a military necessity. All of this work would be under the contract system except about 25% of the surface treatments.

The chief methods will be base patching, bituminous treatments, bituminous concrete resurfacing, spot patching and concrete patching. Generally the base patching, spot patching and minor concrete patching are accomplished by Force Account.

The estimate of maintenance and repair revenue for 1944 is $13,000,000 as against an outlay of $17,500,000 in 1943.

A current problem is that of snow and ice control, especially in the areas where a break-down in these operations may mean thousands of lost work-hours to war workers. Again, scarcity of experienced personnel and lack of repair parts are chief difficulties.

In Ohio, newly developed natural resources, principally coal, have presented a critical transportation problem. Generally the new mines are located in territories served by highways designed for light traffic. In ad-

dition to this, many truck haulers, to save time and avoid traffic, have forsaken the main roads and are using adjacent or parallel roads that were not designed for heavy loads. It is obvious that the resultant maintenance problem is large.

R. I. Worried About Shoulders

From G. H. Henderson, Principal Highway Engineer, R. I.:

The State highways of Rhode Island have thus far come through the emergency in very good shape.

On some of the older roads leading to Army and Naval Bases, the impact of repeated heavy loads has had its effect on the pavements, increasing the number of cracks and causing occasional breaks. For the most part, we have maintained these pavements by simple patching methods and surface treatments, generally using stone cover. Our maintenance department feels that it may be necessary to resurface 10 to 15 miles if the damage continues at the present rate, but no complete reconstruction is contemplated until the war's end.

Ordinary maintenance is performed by our own forces, but if we have to resort to extensive resurfacing, the work will be done by contract. During 1943, we spent about $1,100,000 for maintenance, and we anticipate a budget somewhat higher this year.

For two years we have concentrated on preservation of pavements, neglecting shoulders to some extent. As all shoulders are bituminized, further neglect may tend to extensive and costly repairs or reconstruction. We hope to give more attention to shoulder maintenance during 1944.

Lost Ground in Missouri

From Carl W. Brown, Chief Engineer, Missouri State Highway Department:

It is impossible for us to say to what extent roads have deteriorated, but there is no doubt but that we have lost ground. Perhaps the best maintenance picture we can give you is to outline the policy that we have followed during the past two years and the money expended.

Manpower has been our most critical problem. As our trained maintenance personnel left to go into the armed service or to obtain higher wages in war industries, we found it necessary to eliminate or postpone many routine maintenance activities. We followed the policy followed by most states by setting up surface maintenance as the most important task, and have endeavored to maintain surfaces to our prewar standard at all times. This we have failed to do on portions of some of our routes where heavy truck traffic increased rather than decreased. Invariably this traffic was concentrated on older roads.

Next in importance is drainage. We have made an effort to keep waterways open and drainage functioning properly at all times. Roadside activities, right-of-way mowing, cleanup, etc., have been curtailed.

1940 and 1941 were considered years of normal maintenance conditions, and in 1940 we spent approximately $5,800,000 and in 1941 $5,900,000. In 1942 the figure was $4,250,000, and in 1943 we were able to spend about $4,600,000. Expenditures during 1942 and 1943 should have been on an increase—normally, around $6,000,000 to $6,200,000—due to the additional age of the highways.

Our maintenance allotment for 1944 is $6,000,000 and we will adhere to wartime policies. We hope to utilize this allotment, but we are unable to estimate at this time how much will be spent. The major portion will be spent for routine maintenance. We do not anticipate any major reconstruction, and little, if any, heavy repairs. On bituminous surfaces, our maintenance operations will consist of spot patching, upper decking, and surface treatments by hot seals with chip courses.

Maintenance of pumping slabs on concrete pavements is our most critical problem. We are attempting to control this condition by the use of the mud-jack, supplemented by upper decking with bituminous material. We have been using this method for the past two years and have had sufficient success to justify its continuation.

1130 Miles in N. Dak.

From Ray Robinson, Maintenance Engineer, N. Dak. Highway Dept.:

Six hundred miles of regraveling, costing $200,000, was carried over from 1943. This work should have been done to maintain roads in good condition.

Sealing of bituminous surfaces during 1943 consisted of light bituminous applications with a sand cover. Under normal conditions, when equipment and labor are available, more expensive and better jobs would have been done.

Our 1944 program calls for 860 miles of regraveling ($300,000), 230 miles of sealing ($190,000), and rebuilding and graveling of about 40 miles ($60,000).

We anticipate having to do most of the work with our own forces, and if so, all of the major maintenance work will consist of light regraveling, bituminous patching and light sealing with sand cover. There probably will be few contractors available for this work, since most from this state are working on the Alaskan Highway or have other government contracts. Part of the above work will be let by contract if contractors are available and prices are not excessive.

The fact that the highway construction program is practically at a standstill has placed an additional heavy burden upon the Maintenance Department. The Maintenance Department is forced to maintain old, worn out roads which under normal conditions would have been rebuilt to a new type, modern road. The additional heavy truck traffic over these same roads has caused them to deteriorate very rapidly. These sections of road were not designed to carry such excessive loads.

900-1000 Miles Retreatment in S. Carolina

From C. R. McMillan, State Highway Engineer, S. Carolina:

During 1943 expenditures for all new construction amounted to $2,650,000 as compared with a normal $10,000,000 average. Fifteen construction contracts totaled $1,550,000.

Maintenance expenditure in 1943 was about $1,650,000, or 40% of normal, was restricted to purely essential work. No retreatment or shoulder treatment was undertaken and no new equipment purchased.

The 1944 outlook is contingent upon the national situation. In addition to material and equipment shortages, manpower shortages in the middle age brackets make it uneconomical and inadvisable to undertake any expansion in maintenance operations.

The financial position of the state during the past 20 years has never permitted a construction program in proportion to needs. As a result, need for additional highway improvements have mounted annually; and, since the complete disruption of construction during the war, our highway improvements are lagging far behind the minimum requirements for adequate facilities.

To date we have plans entirely completed for $16,000,000 in projects and field surveys for another $10,000,000. With our present personnel, we can have by July 1, 1944, road and bridge plans entirely completed, and ready for starting construction, on projects estimated to cost $25,000,000.

Apart from construction and reconstruction, we now have a pressing need for retreatment of our bituminous surface-treated roads. We have found from experience that about one-fifth of our 4,600 miles of such roads, or from 900 to 1,000 miles, need re-

treating annually. Practically none of this work has been done during the past two years, which simply means that even if we could get started on this work in 1944 we would have some 3,000 miles to retreat at an estimated cost of from three to four million dollars. Every year that the work is postponed the condition of the roads become progressively worse, and unless some of the mileage is retreated in 1944, a considerable mileage will need reconstructing.

The Texas Picture

From D. C. Greer, State Highway Engineer, **Texas:**

The highways of Texas are in very good condition considering difficulties in securing manpower, equipment and materials. Some are in better condition than prior to the war, while on others we are losing ground daily.

Some arterial sections, especially those designed and constructed a decade ago, are deteriorating rapidly, caused primarily by increase in heavy transport. No doubt this increase has been caused primarily by the war and the necessity of moving supplies and equipment, as well as commodities, but until three years ago our statutes provided for a maximum pay load of 7,000 lb. net. The Legislature in 1941 raised this to 38,000 lb. gross, and very shortly thereafter we began to notice a gradual deterioration of certain highways not designed for this traffic. Many such sections would have been reconstructed except for wartime restrictions. I am pleased to report that the deterioration is rather slow. We have no pavements which might be placed in the category of complete disintegration, and every effort is being made to maintain our highways in as satisfactory a state as possible. As a matter of record, we have had no complaints from the traveling public, usually a good criterion.

Only a few minor projects are being carried over from 1943. Last summer we had a $3,000,000 asphalt program with a $1,500,000 carry-over. All force-account work was completed, but our contractors were not able to complete their work due to weather conditions, and we considered it advisable to defer their contracts until 1944.

Another program of heavy repairs, resurfacing, and in some few instances of reconstruction will be developed this January and February. The preponderance of work will consist of sealing and resurfacing asphalt pavements, the removal and replacing of disintegrated sections of concrete, and possibly resurfacing the sections so repaired with some type of asphaltic concrete or rock asphalt. It will total 2,000 to 2,500 miles.

We rely principally on seal coat work and bituminous blanketing of asphalt which begins to show signs of raveling or cracking. This work is only performed however on pavements where the bases are considered adequate and we will not lose further investment on resurfacing.

In many instances we have scarified existing asphalt pavements, added additional good base material for the full crown width, with some type of asphaltic treatment. This work has been performed in practically all parts of the state at minimum cost and to distinct public advantage.

Spot patching is performed as routine, and our employees are very zealous in the prevention of pot or chug holes and the removal and replacing of any failing sections.

We have kept several mudjack machines in constant use for two or three years. Except for wartime restrictions, more would be purchased. Pumping at joints and subsequent cracking of concrete near joints are prevalent throughout the state, and every attempt is being made to stabilize material under joints as fast as possible with our limited equipment.

Extensive Contract Repairs

We anticipate that a rather large percentage of our seal coat and bituminous pavements will be placed under contract. We have a rather liberal amount of good asphalt equipment in the various districts, and much of this work could be performed by day labor methods. Under present conditions, however, with a shortage of manpower and many of our contractors looking for work, we believe it would be advantageous to all parties concerned to contract as much of this work as possible.

Our maintenance budget, fiscal year to Sept. 1, 1944, is $7,561,197, allocated to maintain over 24,000 miles of highways. We anticipate a $5,000,000 asphalt and betterment program during the late spring, summer and early fall.

We are not particularly short on equipment, and that which we do not own can be rented from counties, municipalities, or contractors. Nor is the material situation particularly critical. Many of the materials entering into the maintenance of highways are non-critical and are readily available, and by anticipating in ample time the need of those materials that are critical or essential and the submission of the necessary documents to secure them, we have found that we have little difficulty in securing them in time to make necessary repairs.

Our greatest problem is manpower. Other agencies are securing many of our skilled operators by offering a wage scale with which we cannot compete. In addition, and despite the fact that the maintenance of highways has been listed by the War Manpower Board as being essential, local draft boards are continuing to disregard the mandates of the Board and are taking many of our employees. Fortunately, we have a large number of men beyond the draft age who are loyal to the Department and are staying with us despite rather attractive offers from other agencies. In addition, there are District Engineers who, with the assistance of co-workers, are securing many employees well beyond the draft age who are performing good work within their limited abilities.

In any case, we expect to maintain our highways in as satisfactory a manner as is possible under existing conditions, and I can assure that no Texas state highway will reach such a state as not to be easily and safely passable.

Army Helped Restore One Arizona Road

From Bernard Touhey, State Highway Engineer of Arizona:

Arizona has no accumulated or delayed maintenance and repair work at this time. We have to date been able to keep abreast of these conditions and in some cases, slightly in advance. However, it has been necessary to increase maintenance forces at some points for short periods. This has been accomplished without overrun of budget.

Thus far we have been fortunate in not having had any heavy problems due to war or restricted materials. The single near incident of this nature was State Route 95—a graded and gravel surfaced secondary, 71 miles in length over and across which some 200,000 to 300,000 troops, tanks and trucks have been maneuvering for the past year and a half. The result was that the department was forced to close and post the road to the effect that it was "Closed and Not Safe For Civilian Traffic." The army's answer to this was that they immediately took steps to place the entire distance again in travelable condition. This work included the restringering with timber stringers, extent of 80% replacement of a 969 ft. by 16 ft. suspension bridge. The state had

(*Continued on page* 60)

Highway Research Board Meeting

Further excerpts (continued from December R&S) from selected papers given at the Board's recent annual meeting in Chicago

Pavement Width. The transverse placement of vehicles as related to cross-section design was studied by Asriel Taragin, PRA, who has obtained long-needed data on the position and speeds of vehicles. Day-night observation covered 17,000 vehicles on 5 road sections consisting of 18, 20 and 24-ft. concrete with grass shoulders. Found: that the distance from the center maintained by free-moving passenger cars did not increase with the slab width until a 24-ft. pavement became available. Free moving vehicles hug the center-line more than the edge, swerving out when meeting buses or trucks. Cars averaged 1.9 ft. edge clearance, trucks 4 ft.

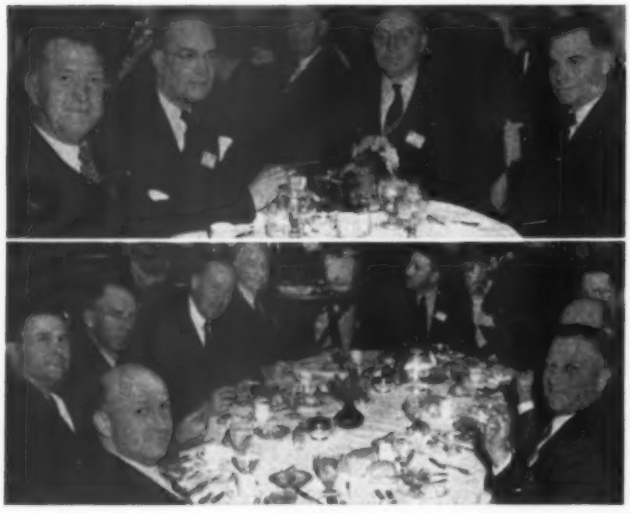
Joint Design. H. W. Giffin, engineer of survey and plans, New Jersey, aroused much interest in his paper, "Transverse Joints in the Design of Heavy Duty Concrete Pavements." In his state traffic ranging from 10,000 to 60,000 vehicles daily brings out any pavement weaknesses in a hurry. In 1930 joint faulting occurred on 9-in. uniform pavements laid in 1928 in which joints had been reinforced with six ¾-in. dowels grouped three in each corner. In 1932 a circular test road was built which embodied various promising joint designs. A butt joint faulted early, joints with six dowels loosened early, joints with 12 dowels loosened less rapidly. However 12-dowel joints used under ordinary traffic from 1932 to 1943 have faulted extensively even with mud-jacking.

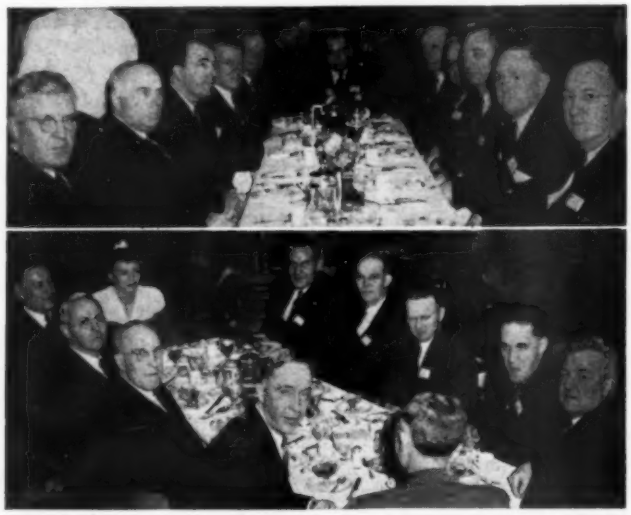
Joint structures having flat dowel bars placed on edge, and flanked by small channels to distribute the load and decrease wear at the joint faces, showed practically no deterioration. A ledge joint laid over concrete sills also gave excellent durability.

A joint with 12 channel dowels was adopted by New Jersey in 1933. This heavy joint, costing about a dollar a foot and representing up to 6 per cent of the cost of the pavement, also includes angles at top and bottom joint faces. The joints, with ½-in. premoulded bituminous-impregnated self filler, have been spaced at 56-ft. intervals. Unusual attention has been given to accuracy of assembly and care in installations. This joint appears to be satisfactory for New Jersey conditions, although some unexpected defects have developed over the years.

Mr. Giffin concludes that heavy-duty concrete pavement design must include (a) a non-erodible subgrade, preferably somewhat porous, capable of withstanding high unit pressures around joints; (b) a sturdy load distribution device, free from restraint and long lasting; (c) adequate steel reinforcement to hold cracks together, to assure full load transfer and prevent infiltration; (d) joint fillers that always fill the space. In this connection he suggests that perhaps the allowance for expansion can be lessened, counting on summer pressures to develop that will incidentally decrease summer warping. He also looks ahead to the possibility of substituting steel springs for steel reinforcing, with controlled compression offsetting winter tension as a permanent design condition. Wood joints, used during the war, give promise as a good type of filler.

Traffic Zone Paint. A committee report by D. H. Dawson and A. Skett, J. E. Myers, chairman, entitled "Accelerated Testing of Traffic Zone Paints," concluded that accelerated





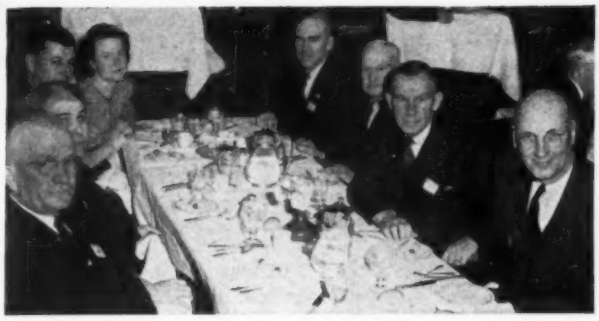
At the AASHO Annual Banquet in Chicago

100%Utah table: Lester A. Blackner, commissioner; W. L. Anderson, chief design engineer; John S. Evans, comm. chairman; Layton Maxfield, comm'r.

Louisiana highway delegates' J. N. Ball, Jr., district engr.; J. B. Carter, bridge standard engineer; J. E. Jarman and E. H. Goodloe, dist. engineers, all of La.; W. C. Slee, airport engineer, Washington, D. C.; Frank R. Kentopp, gen. mgr. Northfield Iron Co., Minneapolis; Paul E. Lirette, r. of w. engineer; H. L. Lehmann, testing and research engineer, and W. J. Hughes, const. standard engineer, of La. highway comm.

Fred White, chief engineer, Iowa; Thos. H. MacDonald, U. S. Commissioner of Public Roads; Congressman Jennings Randolph, R. A. Allen, state highway engineer, Nevada; J. A. Anderson, highway commissioner, Virginia; Congressman Jesse P. Wolcott (Mich.), House roads committee; Carl W. Brown, chief engineer, Missouri; T. H. Cutler, state highway engineer, Kentucky; H. E. Sargent, commissioner, Vermont; J. S. Williamson, chief highway commissioner, S. Carolina; W. W. Polk, chief highway eng., Ill.

Lower table (beginning extreme left): Chas. M. Upham (ARBA); Mrs. and Mr. E. L. Roettiger (Wis.); G. W. Briley, chief acc. (Tenn.); H. T. Ammerman, maint. engr. (Tenn.); C. W. Phillips, commissioner (Tenn.); A. R. Taylor, Koppers Co.; W. T. Brooks, Sta. hy. engr. (Tenn.); E. M. Turner, traffic engr. (Tenn.); O. L. Kipp (Minn.); Fred Schnepfe (PRA)



Mostly Kansans at the AASHO annual banquet: Mr. (and Mrs.) A. C. Hancock and Mr. (and Mrs.) Harold K. Snider, Kansas highway comm.; R. C. Keeling, state hy. engr.; W. S. Arbuthnot and L. J. Robinson, Ks. hy. comm.; Milo P. Flickinger, exec. sec'y, Ill. Contrs. Assn.

tests allow good estimates of service to be expected from various paints. The data show good correlation between the Dorry Abrasion Test and road durability, but this test alone will not exclude brittle or poorly adhering paints. Quick tests for weathering on concrete show good correlation with road durability, but perhaps further study is needed with some combination of abrasion, adhesion and flexibility to develop a quick laboratory test of paints.

Flexible-Pavements. John Lowe, of Mass. Inst. of Technology, on "Test Apparatus for Measuring Slab Action in Flexible Type Pavements," emphasized that slab action is the fundamental action of a flexible pavement. He described a system of jacks used to measure load reactions and total pressure distribution on road subgrade under a circular wheel load. Two base course materials tested both showed definite slab action under static load.

Herbert E. Worley, associate soils engineer, Kansas, on "Triaxial Testing Methods Usable in Flexible Pavement Design," told how soil specimens were tested under a method by which lateral support was provided along with vertical loading. From extensive data he concluded that a definite pavement design method is available by this means.

Subdrainage. "Large Scale Model Studies of Highway Subdrainage," by T. B. McClelland, Purdue Joint Research Project. Tests covered the problem of lowering ground water by two roadside or lateral drains. Results emphasized the difference in rate of lowering for various soil types.

Runway Design. A report of committee on flexible pavement design, "Thickness of Flight Strips and Airplane Runways," by A. C. Benkelman, Public Roads Administration, noted the wide divergence of opinion on runway design. It outlined a design method based on large-scale loading tests of three trial sections on a prepared subgrade—one to normal army design, one 50 per cent over and one 30 per cent under in section.

Direction Signs. "Design of Signs for Pentagon Road Network," by D. W. Loutzenheiser, PRA. This paper described office studies and field trials to obtain best sign system for this elaborate roadway layout. Over 400 plywood signs were erected after studies of best legend lines, sign sizes, shapes of arrows, sign locations, etc.

Soil Classification. C. A. Hogentogler, Public Roads Administration, in committee report, "Classification of Materials for Subgrades and Granular Type Roads": In addition to widespread recognition of the A-1 to A-8 groups, certain states have adopted modifications, some quite radical. On the other hand materials of widely differing characteristics have come to be considered within various designated classifications. To remedy the situation the HRB set up a project committee on soil classifications. Mr. Hogentogler's report deals with 12 classes—one granular type road material, one granular type base material, two drainage course materials, six subgrade soils, all fairly evenly divided as to liquid limits and plasticity indexes.

Alignment. "Influence of Alignment on Operating Characteristics," by O. K. Norman, senior highway engineer, Public Roads Admin., analyzed results of driver-behavior and vehicle-performance studies made before the war to determine effect on speed of sight distance which restricts passing. Gives valuable data on spacing and speed of vehicles on straight roadways.

Conclusions: (1) How fast or slow the curves are for a single vehicle isn't necessarily an indication of how fast an appreciable traffic flow can move in safety on a 2-lane highway. (2) Sight distances that will permit safe passing are fully as important in design as curvature, gradient, superelevation, or non-passing sight distance. (3) The slowest possible operating speed during the 50 busiest days of the year, plus 20 mph, gives the speed limit that can probably be justified unless higher speeds will not increase construction costs. (4) Two-lane highways designed in theory for 70 mph will not provide for operating speeds above 60 mph except at very low traffic densities. (5) If high operating speeds are desired, access must be both limited and controlled and grades separated.

Culverts. Paper, "Culvert Design in California," by G. A. Tilton, Jr., and R. Robinson Rowe, Calif., gave a new conception of design combining two principles: (1) that culverts should pass a 10-year max. flood without static head on the crown, and (2) barrel and appurtenances should have a balanced design to pass a 100-year flood without serious highway damage. Balance culvert design includes rational hydrology, selection of size and type of barrel, location, gradient, entrance and headwalls, outlet and endwalls, and energy dissipation.

Economics. Timely points were brought out by Fred B. Farrell, senior engineer-economist, PRA, in "Current Aspects of Research on Economic Life of Highways." He touched on past extensive road-life and annual-cost studies, and pointed out that the few roads now being built are being constructed under greater economic controls than ever before, required to show wartime justification. He warns against patchwork post-war improvements of uncertain life; these will not rebound to anyone's credit or be of maximum service in national development. Most economical lengths or sizes of construction contracts, and other policies with respect to contract procedure, should be re-examined. Contract costs can be reduced by preparing more complete plans which will lead to lower unit bids, inclusion of mass diagrams and other data that will insure more efficient job planning, etc.

The practice of permitting alternate bids on presumably comparable types was also criticised. This practice, generally for the purpose of admitting certain restricted or patented processes, is short-sighted if award is on basis of lowest construction cost. Generally in such cases there has been little consideration of maintenance requirements of alternate types.

Long-range planners, according to Farrell, must take into account the foundamental fact that when a primary highway system reaches a state of stability its average ultimate life of surfacing is about 33 years and wear-

G. E. Tiffany, engineer of design (Kans.) and W. L. Dyatt, office engineer

ing out will occur at rate of about 3 per cent of the mileage each year.

"Current and Post-War Application of Road Life Studies," by R. C. Faltinson, Texas state-wide highway planning survey: The retirement and replacement trends of state roads as developed from road-life data (state-wide planning surveys) can readily be presented graphically, and graphs analyzed as with human life survivor curves of insurance companies. By a little persuasion these curves can be made to tell an important story ("as the twig is bent the tree will grow"), yielding an appraisal of the influences which will affect life and retirement age of each road type.

"Applications of Highway Economics," by Prof. R. L. Morrison, Univ. of Mich., presented ten fundamental economic principles and examples, showing their application in making comparisons of road projects. Between two points of view he supported the one that government is merely the agency which collects highway funds and uses them for the benefit of taxpayers, these benefits being in the form of earnings of the highways.

Foreign. An international flavor was added by Mo Chih Li, professor of highway engineering and director of the highway engineering experiment station, National Tsing Hua University, China. He described research on soil stabilization in co-operation with the bureau of highways of the China ministry of communications. Millions of dollars could be saved on China's 10,000 miles of military roads. Research will be pushed on clay binders and other cheap local materials such as burnt-clay, quick lime and cinders.

Pumping Joints—"Pumping of Rigid Pavements in Indiana," by K. B. Woods and T. E. Shelburne (further details continued from Dec. R&S.):

Corrective measures suggested for slabs where pumping has already begun: keep surface water from entering the subgrade by sealing cracks and joints, and maintaining to eliminate edge ruts; provide good ditches and outlets; install subsurface drains, vertical drains of porous understratum exists; force sealing mixture under slab to fill voids created by pumping.

Findings: Pumping exists only when all three factors of poor soil, excessive water and excessive traffic loads are present. Pumping has occurred in Indiana on plastic clays and plastic silty-clay soils, but not on granular soils. Most Indiana soils involved were low-liquid-limit, unleached glacial soils, found primarily in deep cuts with adverse ground water conditions. The position of the grade line on the soil profile had an important bearing; grades in "B" horizon material often spelled pumping. Pumping was observed most frequently during and immediately after rains.

A porous base was usually an effective preventative; also waterproofing treatment of the soil, and any facility that hastened surface run-off.

Clearly better load-transfer means must be developed and use of joints should be minimized. Present treatment to prevent or correct pumping in Indiana and elsewhere is not entirely satisfactory and more research is needed, especially as to the best mud-jack mix.

AASHO Construction Committee Forecast

The following interesting details were omitted from the AASHO convention report in December ROADS AND STREETS:

Daniel Starr of Connecticut foresees that machines will be redesigned for higher octane fuel. There'll be a mass test of synthetic rubbers, some of which will prove superior to natural rubber for their uses. He, too, prophesied higher speed construction with lower unit costs, with greater use of large equipment in the New England area where heretofore the prevalence of small projects has held mass methods back.

D. C. Greer, state highway engineer, Texas, predicts a cry of economy in government and apportionment of road funds; little change in construction practices for a time. War work in Texas introduced wider use of big-capacity asphalt and concrete plants and more use of semi-portable aggregate plants by contractors (hence more aggregate sources).

He urged that thought be given to training the young men who will return from the war and join the highway departments. Many older men now gone to other jobs or to war work will not return to their old work. Young inspectors trained on rush army-camp jobs may need to develop a different conception on more exacting peacetime projects. Mr. Greer would encourage new contractors to enter highway work —young men who can grow up with the department.

(*Continued from page 57*)

anticipated this replacement for some time and furnished the material and supervision for this work.

Pennsy to Spend $22,500,000

Writes C. H. Buckius, Chief Engineer, Pennsylvania:

The general condition of the Pennsylvania state highway system is about equal to that of a year ago. In 1943 we expended about 25% more than in 1942. Approximately 258 mi. of heavy repair work is being carried over from 1943 to 1944. Main items of maintenance in 1943 were surface treatment of 4,061 mi. of bituminous roads ($3,438,412); resurfacing of 240 mi. ($1,200,000); and 100,000 sq. yd. concrete patching ($800,000).

In 1944 we expect to program about 50,000 sq. yd. of concrete patching, surface treat about 4,500 mi., and complete resurfacing on 327 miles.

Our methods will include extensive use of mud jacking, concrete patching, correcting drainage, repairing base failures on both flexible and rigid type pavements, and the surface treatment of the bituminous pavements where required (bituminous blanketing). Contractors will perform about 20% of the resurfacing program. We estimate that about $18,000,000 will be available for the above work, plus $4,500,000 for snow removal and winter service.

Special problems confronting the Pennsylvania Department of Highways are the "pumping action" of joints in concrete pavements; the rapid deterioration of highways due to heavy hauling in the coal area and in the industrial area where war materials are being produced and the inability to reconstruct highways.

Delaware Needs Extensive

W. W. Mack, Chief Engineer, Delaware:

During the past year we have done about 90% of a normal pre-war job. However, we have considerable mileage of our older highways which need resurfacing, reconstructing and heavy repairs.

A study was made of our highway system in 1940 in which it was estimated that 170 miles of main highways needed resurfacing within four years, and 84 miles needed widening to present-day standards. None of this work has been done and naturally there is an increased mileage which needs reconstructing. But a considerable amount will require entire reconstruction owing to postponed reconstruction.

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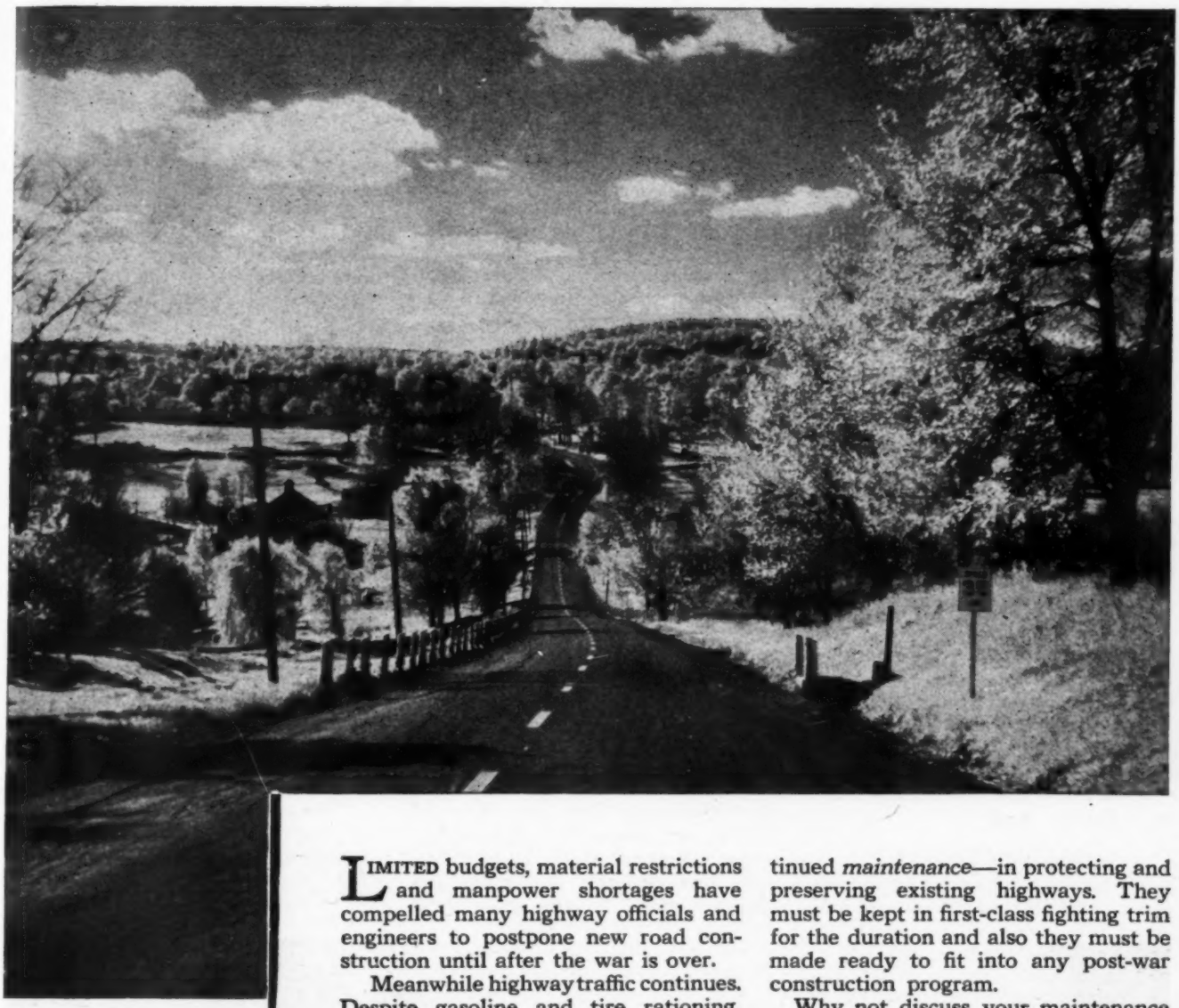

LIMITED budgets, material restrictions and manpower shortages have compelled many highway officials and engineers to postpone new road construction until after the war is over.

Meanwhile highway traffic continues. Despite gasoline and tire rationing, America's roads are actually wearing out faster today than during peacetime. Truck travel, which accounts for 18 per cent of all the nation's freight, is heavier than ever before — and many, many times more important!

The immediate answer lies in continued *maintenance*—in protecting and preserving existing highways. They must be kept in first-class fighting trim for the duration and also they must be made ready to fit into any post-war construction program.

Why not discuss your maintenance problems with the Tarvia field man? He has at his command all Barrett's 38 years of successful paving experience, and he can show you how Tarvia can be used economically and quickly to repair or maintain almost any type of pavement.

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Mississippi Finds Kudzu Effective Cover for Highway Slopes

A southern embankment crop cover that has wartime conservation as well as post-war possibilities beyond present limited use

By ARTHUR W. SUSOTT
Chief, Regional Division of Information, Southeastern Region, Soil Conservation Service, Spartanburg, S. C.

WORK of maintaining steep roadbanks along Mississippi's paved highway system has been greatly simplified through the use of kudzu, an oriental legume, whose runners grow from 20 to 50 feet in a single season. The plant is a perennial and, once established, requires no replanting. Since the first planting in 1936 made on a highway cut near Meridian, a total of 347 miles of steep roadbanks along Mississippi's principal highways have been planted to kudzu.

"There is no maintenance cost to kudzu except an occasional mowing along the shoulders of the roadway," says J. D. Monette, acting chief state highway engineer in Mississippi. "Due to the good, deep root system and its ability to tie itself with vines from the top of the bank, kudzu is not as susceptible to land slides as most other types of vegetation."

"One good feature of kudzu," Mr. Monette adds, "is the longer it stays, the better it gets; whereas under certain conditions, the longer grass stays the poorer it gets."

In Mississippi Since 1936

Mississippi highway officials became interested in kudsu as a protective cover for highway roadbanks in 1936 when the state launched its extensive highway improvement program that called for building or improving 2,500 miles of state highways. At that time kudzu was relatively new to farmers, but its value for erosion control and as a source of high quality hay and grazing had been demonstrated on farms in erosion-control demonstration projects of the Soil Conservation Service. Even on poor, badly eroded farmland, kudzu made good growth when the land was properly prepared and fertilized.

The first trial planting on a deep cut on U. S. Highway 45 about 5 miles north of Meridian was made on Kirvin fine sandy loam, which is one of the poorest crop soils in Mississippi. One side of the steep cut was planted to kudzu, and the other sodded to grass. Two years later the kudzu had covered the slope with a dense network of vines and little erosion was evident. The grass sod, however, failed to grow and a large part of the bank was left exposed and began to erod badly. Following this trial planting, cooperative agreements for further plantings on steep highway banks in other parts of the state were entered into by the State Highway Department, the Soil Conservation Service, and County Boards of Supervisors.

How Crop Is Established

The method now followed in establishing kudzu on slopes of highway cuts is to set the plants along and slightly back of the top edge. The young plants send their vines draping down over the edge of the bank and attach themselves to the soil with new crowns or root systems that form at the nodes every 12 to 16 inches along the vine. Setting plants along the top of the highway bank is more satisfactory than planting directly in the slope where the soil is poor and barren and growth is likely to be slower. On extremely long, deep cuts, spot planting, however, may be needed to hasten ground cover.

"The speed with which a good stand of kudzu can be established depends largely on the care exercised in planting," says C. B. Anders, state conservationist of the Soil Conservation

A dense heavy cover for the slope on the right side of U. S. Highway 45 near Meridian was provided by kudzu in its second growing season during 1937. The slope on the left was sodded to grass which failed to grow, leaving the bank exposed to erosion

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Developed to meet the concrete forming requirements in airport slabs from 12 to 24 inches thick. Bases are 10 and 12 inches wide. Dual Stake Pockets and Double Treads permit the form to be used with either dimension for the webb.

Sections are 10 and 15 feet long and provide the means of forming both concrete airport slabs and access roads with a single set of forms.

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Fig. 1. Setting forms for a 15" concrete airport runway.

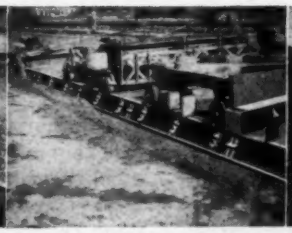

Fig. 2. Finishing a slab 25' wide, 15" thick in one pass.

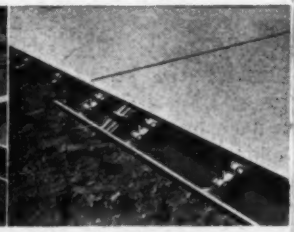

Fig. 3. The same set of forms used with the 10" base as the webb.

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Left: Numerous steep cuts in U. S. Highway 61 in the vicinity of Port Gibson, Miss., have their unsightly banks hidden by kudzu. Slope of the banks in most cases was so steep that it would have been difficult to establish grass cover. Right: Here's a view of a steep cut on U. S. Highway 61 near Port Gibson, Miss., before it was planted to kudzu in the spring of 1937

Left: Gullies that form in road cuts or in fields near roads frequently are the sources of silt that interfere with road drainage and add to the maintenance. This gully on State Highway 17 near Lexington, Miss., was stabilized by planting kudzu. Right: This is the same gulley on State Highway 17 near Lexington, Miss., covered with kudzu. The kudzu was planted in the spring of 1939

Service in Mississippi. "Proper fertilization is especially important. A liberal application of complete fertilizer should be applied in the row along the top of the highway cut, and if spot planting is done on the slope, a pound of complete fertilizer should be put in each hole. In no case should the fertilizer be permitted to come directly in contact with the plant as it will burn the root. This can be avoided by covering the fertilizer with earth before setting the plant."

"Too many people who have seen dense stands of kudsu get the impression that it will grow quickly on most any soil," continued Mr. Anders. "Chances are that it will grow on poor soil without fertilizer, but it may take 3 to 5 years to get a satisfactory cover. Where poor soil is prepared properly and adequately fertilized, a good cover can be obtained in two years, and even the first year the cover will be rather effective in halting the ravages of erosion."

Where Kudzu Is Suitable

Kudzu is deciduous and drops its leaves after the first killing frost in the fall, but the leaves, together with the network of vines, form a heavy layer of absorptive organic material that checks runoff and prevents erosion during winter. The plant grows from Maryland to Florida, but it is probably best adapted to the middle and lower South where the growing season is long and annual rainfall is relatively heavy.

Most of the kudzu establishment work on Mississippi's highways is now done by private contractors and by maintenance crews of the highway department. Crowns for planting may be bought from farmers as an occasional removal of planting stock does not harm the stand, or crowns for planting may be dug from the sides of highways where good stands have been established.

In addition to the 347 miles of kudzu-protected slopes along main highways, 235 miles of slopes on secondary roads in Mississippi have been planted to kudzu as a result of cooperative projects undertaken by farmer-organized soil conservation districts and county boards of supervisors. The soil conservation districts also encourage farmers to stabilize gullies by using kudzu. Gullies located near highways and left uncontrolled frequently are the source of heavy silt deposits that clog roadside drainage systems.

Other states in the South have made good use of kudzu in highway erosion-control work, but Mississippi probably outranks all states in the number of miles of highway banks treated in this manner. War conditions naturally have slowed down improvement work of this type, but in the post-war period kudzu will undoubtedly be used more and more in stabilizing and beautifying highway banks in the South.

The experiences of war have proven the value of Cletrac Tru-Traction

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MEETINGS AHEAD

Jan. 25-27, National Sand and Gravel Association, Hotel New Yorker, New York, N. Y.

Jan. 26-28, National Ready Mixed Concrete Association, Hotel New Yorker, N. Y.

Feb. 1-3, American Road Builders' Association, Edgewater Beach Hotel, Chicago, Ill.

Feb. 7-9, Associated General Contractors, annual board meeting, Drake Hotel, Chicago.

Feb. 9-10, Southeastern Association of State Highway Officials, Hotel Roanoke, Roanoke, Va.

Feb. 10-11, Ohio Society of Professional Engineers, Deshler-Wallick Hotel, Columbus, O.

Feb. 17-18, Association of Highway Officials of North Atlantic States. Conference on post-war and related problems, Pennsylvania Hotel, New York City.

Feb. 28 - 29 - March 1, Michigan Highway Engineering Conference, Grand Rapids, Mich.

▼

Rough Roads Harm Cars, Says S.A.E. Report

The need for keeping highways in good condition, and the importance of careful driving are demonstrated in a report "Effect of Holes and Ruts in Highway Pavements on Tire Life," made by the SAE War Engineering Board to the Automotive Council for War Production. (S. A. E. Journal, July, 1943). Deep holes and ruts in highways drastically reduce the life of tires and other parts, and may even result in immediate failures the report concludes.

The following factors are listed (1) Where many holes, weaving effort of driver to avoid them increases tire wear, car weight is shifted from side to side, and, with dual tire equipment, from one tire to the other. (2) In trying to avoid holes, the driver accelerates and uses his brakes frequently—rapidly wearing tires. (3) Defective shoulders are hard on tires; tires may be damaged by hard edge of pavement. With dual tires, the inner tire may carry all the load for short periods. (4) The effects of defects are augmented by under-inflation and overloading. (5) Older tires now used too much are more susceptible to breakage by bruising. (6) Rough roads can have serious effects on the vehicles themselves, producing fatigue failures of axle shafts, springs, etc. (7) More misalignment of the front wheels—another cause of rapid tire wear.

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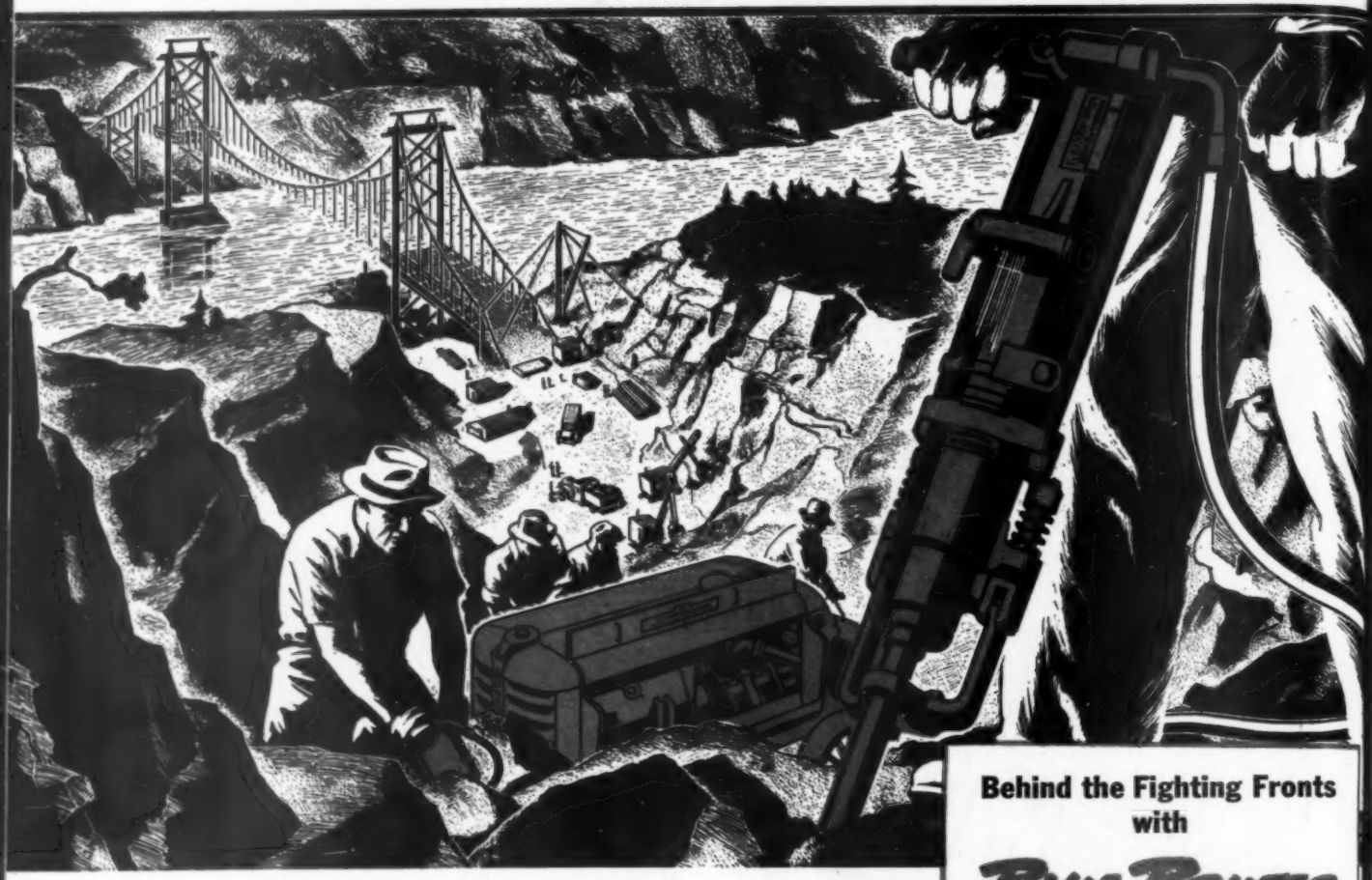

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BLUE BRUTES

Blue Brutes in wartime girdle the globe. Colored olive drab for Army, battleship gray for Navy, they speed the flight of Fortresses from jungle air fields, help keep shell-shocked roads in occupied territories open to military traffic, and help build cantonments in the Arctic. On the Alcan highway, in Australia, on the Mediterranean fronts — and in hundreds of Army camps, Navy yards, air bases and ordnance plants here at home — Blue Brutes help the men who fight for our future. Your nearest distributor is listed on page 69.

You'll want to know now what Blue Brutes can do, because some day you'll be bidding on jobs like this one:

A post-war development program for Portland, Ore., involving three new bridges, a complete new system of "thruways", a $10,350,000 sewage disposal plant, 6 grade school buildings, railroad depot, etc . . . Expenditure: $60,000,000 in 2 years for construction alone.

If every new compressor and air tool you buy saves only a fraction of a cent per foot, they'd still be worth big money on jobs like that.

Worthington Blue Brute compressors, like the one shown here, cut costs because they're made for easier breathing. Impact-free Feather Valves* which give Blue Brutes the nearest mechanical approach to human breathing, have Nature's simple strength.

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So, when you're figuring costs on that big job of tomorrow, bid with Blue Brutes in mind. They'll back the bid with what it takes to keep costs down. And that's your money's worth.

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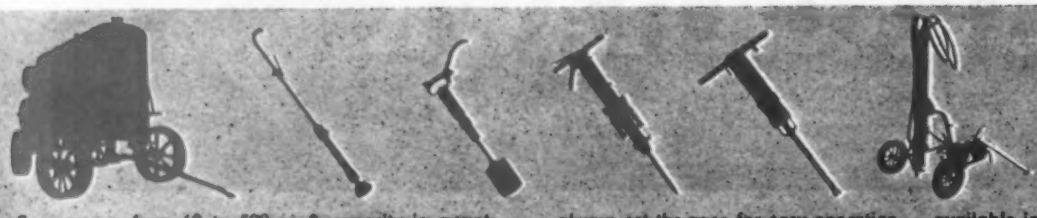

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Magnetic Road Sweeper Had Busy Year

By GEORGE TESKEY
Assistant Maintenance Engineer, North Dakota State Highway Department, Bismark

THE magnetic road sweeper owned by the North Dakota state highway department is mounted on a regular 1½-ton truck. It is composed of a Ford V-8 power unit direct-connected to a D.C. generator. The sweeping unit consists of three electro-magnets, one placed in the rear of the truck and one on each side in front of the rear wheels. These magnets are normally operated about 3 inches above the road surface, and cover a width of 8 feet. The equipment must make at least three trips over a highway to completely cover the traveled surface. It will pick up any metal which contains iron —pieces of wire, nails, tacks, screws, bolts, bottle caps, and small hand tools such as pliers, wrenches, etc.

The sweeper was operated this year during August, September and early October. It was not operated during the spring for the reason that it will not pick up metal readily when the roads are wet, but requires perfectly dry roads with the loose material evenly distributed over the surface for the best operation.

The intention was to cover the greater portion of the graveled highways not covered in 1942, and in addition an attempt was made to sweep those highways in the east central portion of the state where a windstorm wrecked a large number of buildings during the early part of the summer and scattered nails over the countryside.

The season average was 7.87 lb., best for this machine since 1936. In fact, there have been only two years season's average was obtained—in 1930, 8.4 pounds per mile, and in 1936, 10.7 lb. per mile. In 1937 and 1938 the average was so low that its operation was discontinued until the present emergency warranted its use beginning in 1942.

Ten Punctures per Lb.

The saving in cost to the traveling public is very difficult to estimate for this machine, but this year it cost us 17 cents per pound to collect over 5 tons of metal. When we consider that a pound of eightpenny box nails contains 145 nails and most tire punctures are caused by smaller pieces of metal than this, we believe we are since the equipment has been owned by the Department where a better very conservative when we say that for every pound of metal collected we have saved the traveling public punctures. At a cost of 50 cents per puncture for repair, to say nothing of the time lost, for every pound of metal collected the taxpayers have saved $4.83.

It is the present policy of this Department to attempt to cover the graveled portion of the State Highway System every two years. With very few exceptions, this machine has covered all of the graveled highways in the last two seasons. It is our plan next year to start over again and cover those sections which were swept in 1942. Due to the fact that these highways were swept within two years, we do not expect to get as large a collection of metal next year as we have in the past two seasons.

1943 Operating Cost of Magnetic Road Sweeper

Unit No. 524 (Truck)—Operated 703 hours at $1.30 per hour		$ 913.90
Unit No. 1940 (Sweeper)—Operated 666.5 hours at $0.80 per hour		533.20
Operator's Salary and Expenses		519.38
Total Cost of Operation		$1,966.48
Miles of Road Swept	1,452	
Pounds of Metal Collected	11,431	
Average Pounds of Metal Collected per Mile	7.87	
Average Cost per Mile	$1.35	
Average Cost per Pound of Metal Collected	0.17	

NOTE: The above costs include all operating expenses plus depreciation on the equipment.

A Good "Harvest" Year

The most "resultful" days of operation this year were from Aug. 28 to Sept. 1, when an average of 15.7, 17.6 and 16.2 lb. per mile was gleaned from three state road sections.

Washington Highway Department Repairs Own Loadometers

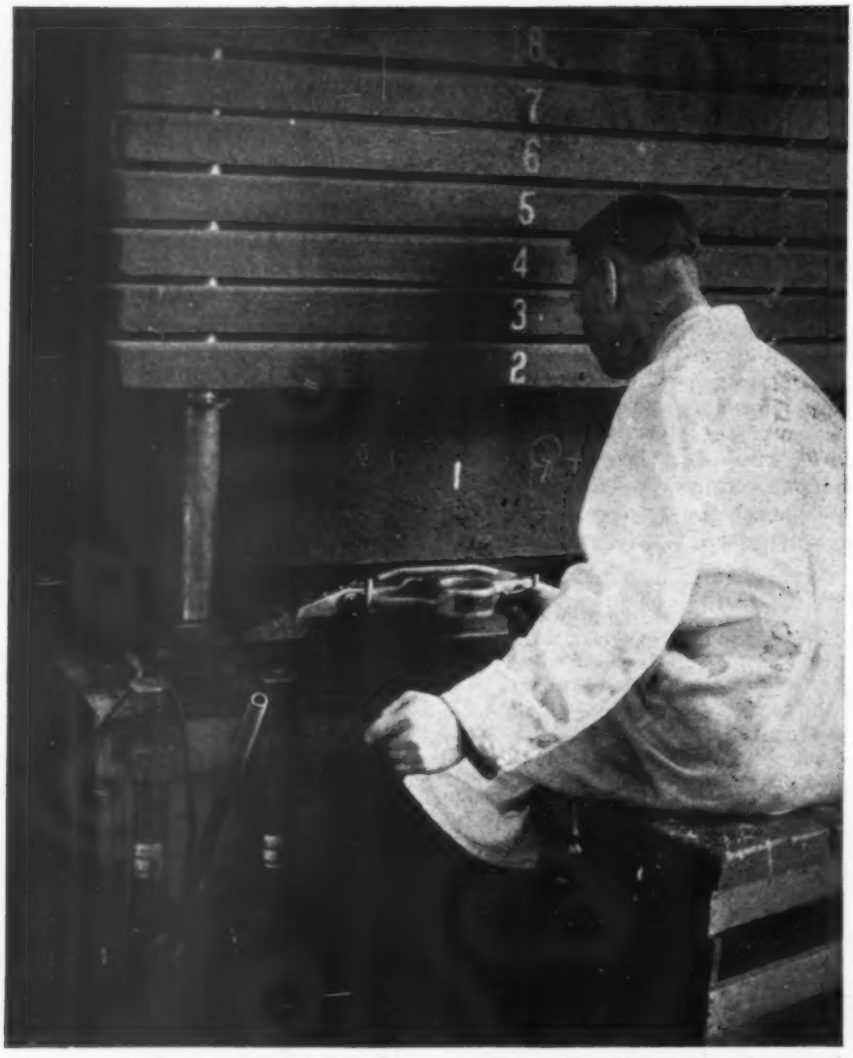
By GEORGE H. SHEARER

District Engineer, Washington Dept. of Highways, Seattle, Washington

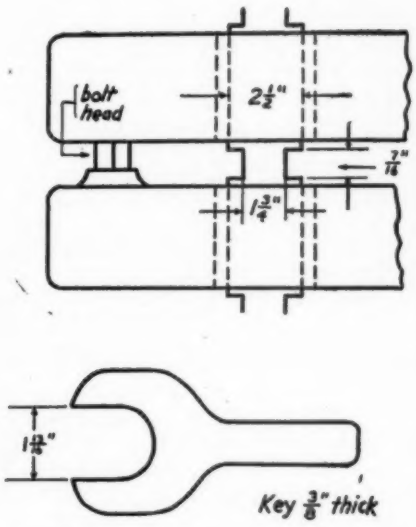
ESPECIALLY since the war began, with the manufacturer of loadometers used by the Washington Department of Highways busy on war work, the state has found it desirable to do its own loadometer calibration and repairs. At our Seattle district shop a method has been developed for testing and calibrating loadometers hydraulically. At first an A-frame and hoist was devised to lift successive weight increments, but this proved unsatisfactory. The present equipment consists of a set of weights operated by a pair of hydraulic jacks and one set of "keys." Fourteen 1,000-lb. cast iron weights arranged in a tier as shown in the accompanying photo. Weights are held in suspension at the level shown when not engaged. The apparent separation space between weights is the result of bolt heads set in each corner for accurate, uniform load transmittal. The four steel shafts passing upward through holes in the casting corners have a key slat at each level. Say two slats or 2,000 lb. may be engaged by inserting keys in the slats below the second slat from the top, 3,000 lb., by inserting below the third down, etc.

The ram located nearest the operator applies the first 1,000 lb. independently by engaging the narrow casting immediately over the loadometer unit being tested. The outer ram operates the increments from 2,000 to 15,000 lb.

Blackhawk body-jack rams and pumps were adapted for the hydraulic system. This equipment has insured calibrations accurate well within the 6 or 8 pounds tolerance allowed by the Washington state sealer of weights. The state's Dist. 1 alone has 60 loadometers. In checking units from all over the state every 3 to 6 months this equipment has saved considerable expense and delay during the past 8 years. In fact it paid for itself during the first year, and has been especially valuable in connection with an extensive truck traffic survey. The equipment was developed by Wm. O. Longtin, District 1 shop foreman.



Loadometer calibration equipment built by the Washington state highway department



Details of keyed shafts and keys for transmitting load increments

New Jersey to Get Cars Off Streets During Snow

As an aid in keeping war-essential traffic moving through snowstorm periods, the New Jersey highway department is conducting a statewide campaign this winter to get parked cars off the streets when storms impend. "Snow Coming—Parked Cars off Streets!" is the slogan. Civilian defense organizations are cooperating with police agencies. Radio, card distribution and other means of educating motorists are being used, to remind people that plow work is hampered by parked vehicles.

When Buckeye Clippers get back into "Civies"!

They used to churn butter by hand!

But today most of it is churned in mechanically revolved "barrels," with manual operations reduced to a minimum. A more uniform and sanitary product has resulted with obvious savings in man hours. MEVAC metered vacuum power control of all operations on the Buckeye Clipper outmodes tiresome tugging and pushing of levers in shovel operation.

Most Buckeye Clippers are "in uniform"—those built before the war and owned by contractors, mines, quarries, clay pits and industrial plants are almost 100% in war work and all those built since the war have been requisitioned by Uncle Sam for use by our fighting forces, at home and abroad.

When Buckeye Clipper convertible shovels with their vacuum power control get back into "civies" they can materially lower your excavating and material handling costs, at the same time increasing your daily yardages. The way they are performing today, under severe handicaps, in all kinds of climates from 120° in the shade to 30° below zero, often at the hands of green operators and frequently enduring long periods without maintenance are indications of what they can do for you.

Look ahead—send for Buckeye Clipper Bulletin 543 which takes the Clipper apart and shows you step by step why it will be the outstanding buy among ½ and ¾ yd. shovels.

BUCKEYE TRACTION DITCHER CO.
Findlay, Ohio

Check Ad Page 15.

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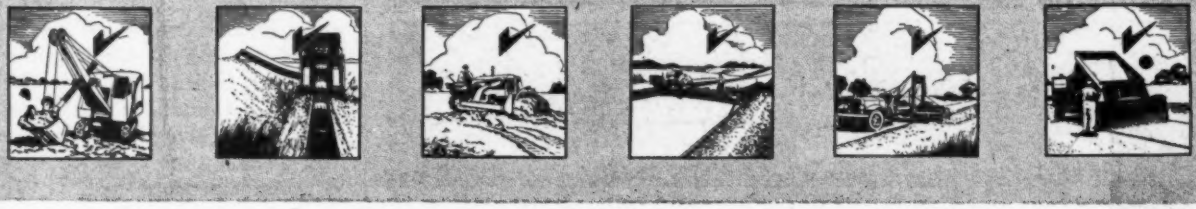
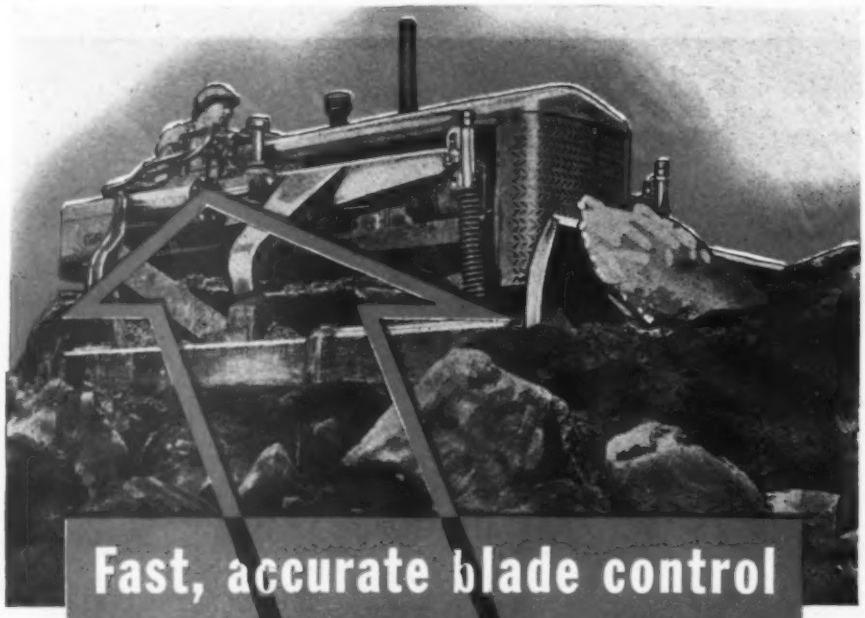
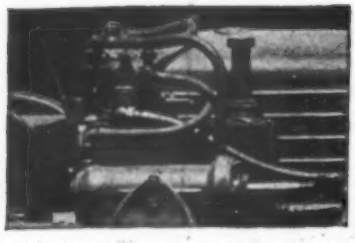
CONVERTIBLE SHOVELS, TRENCHERS AND BACKFILLERS, TRACTOR EQUIPMENT, R-B FINEGRADERS, ROAD WIDENERS AND SPREADERS





Fast, accurate blade control with the sensitive, dependable Heil Hydraulic System

on Heil Bulldozers and Trailbuilders for Cletrac Tractors . . .



Troublefree Hydraulic System
Large diameter cylinders, permitting use of low hydraulic operating pressures. Piston rods are chromium-plated to avoid rusting and subsequent pitting.

Below:
Heil Hydraulic Pump, equipped with roller bearings for longer life. (Regularly rear-mounted — may be front-mounted.)

Efficient operation depends on instant response to a touch on the controls. That's what your operator gets with the Heil hydraulic system — whether it's rough, tough going among rocks and stumps, or he's doing a "smoothy" on landscape finishing. And he *keeps on getting* that same speed and accuracy, because this is the next thing to a perfect leak-proof unit. It stays in adjustment, gives minimum trouble through a long, hard life. Perfect balance, full visibility, many other Heil features assure you of full loads and bigger profits. Equip with Heil. Write for bulletins.
R-20

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GENERAL OFFICES • MILWAUKEE 1, WISCONSIN

Hoffman Speaks A.R.B.A. Annual Meeting

Chicago, February 1, 2, 3

Paul G. Hoffman, president of Studebaker Corporation and chairman, Committee for Economic Development, will be one of several headline speakers at the American Road Builders' Association Postwar Highway Conference, Feb. 1, 2 and 3, Edgewater Beach Hotel in Chicago.

Says ARBA's engineer-director, Chas. M. Upham, "Mr. Hoffman will give the highway industry pertinent suggestions on meeting our postwar problems. It is vital that we work out a cooperative plan with the Committee for Economic Development, which is making excellent progress for postwar employment."

A highlight will be the panel discussion of whether there will be dumping of surpluses of construction machinery by the Army and Navy. Representatives of the U. S. Treasury, WPB, Congress, and the highway industry will participate.

The Conference will consider means of placing the A.R.B.A.'s proposed $3,000,000,000-a-year Postwar Highway Program in effect. Authoritative speakers will discuss the possibilities of Federal Aid for local roads and streets as well as state highways.

Speakers will include: Col. Wm. N. Carey, chief engineer FWA; Samuel C. Hadden, chairman Indiana Highway Commission; Hon. Carter Manasco, chairman house sub-committee on distribution of war surpluses; R. G. LeTourneau, president of the LeTourneau Company; Hon. Jesse P. Wolcott, house roads committee; Hon. J. W. Robinson, chairman, house roads committee; H. E. Hilts, Deputy Commissioner, Public Roads Administration; James J. Skelly, president, Highway Contractors' Division; Arthur F. Ranney, county engineer, Summit County, Ohio; R. W. Gamble, president, Municipal Division, and W. Vance Baise, State Highway Engineer, North Carolina.

Because of rationing restrictions, those who plan to attend the Conference are urged to write *in advance*.

The Old Timers' Reunion will be held Tues., Feb. 1. President's Dinner, Marine dining room, Wed., Feb. 2.

▼

Meetings A. S. T. M.—The spring meeting and Committee week of the American Society for Testing Materials will be held Feb. 28 to March 3 at the Netherland Plaza Hotel, Cincinnati, O. The 47th annual meeting will be held June 26 to 30 at the Waldorf-Astoria, New York, N. Y.

Annual A.G.C. Meeting

February 7-9 in Chicago

The 25th annual meeting of The Associated General Contractors of America will be held Feb. 7-9, 1944, Drake Hotel, Chicago. The meeting will consist of the Governing and Advisory Boards, attended also by chapter presidents and secretaries, rather than a convention of the full membership.

The present Governing and Advisory Boards will meet Feb. 7 and 8, and the boards composed of newly elected members will meet on Feb. 9. The meetings will be open to the public. Meetings of the Executive Committee and the A.G.C. Secretaries' Council will be held Sunday, Feb. 6.

Says A.G.C.'s President Oscar B. Coblentz, of the McLean Contracting Co., Baltimore: "At the present time one principal association function is to assist in pioneering the way to postwar conditions. Construction was the first major industry to swing into war production. It will be the first to return to normal production.

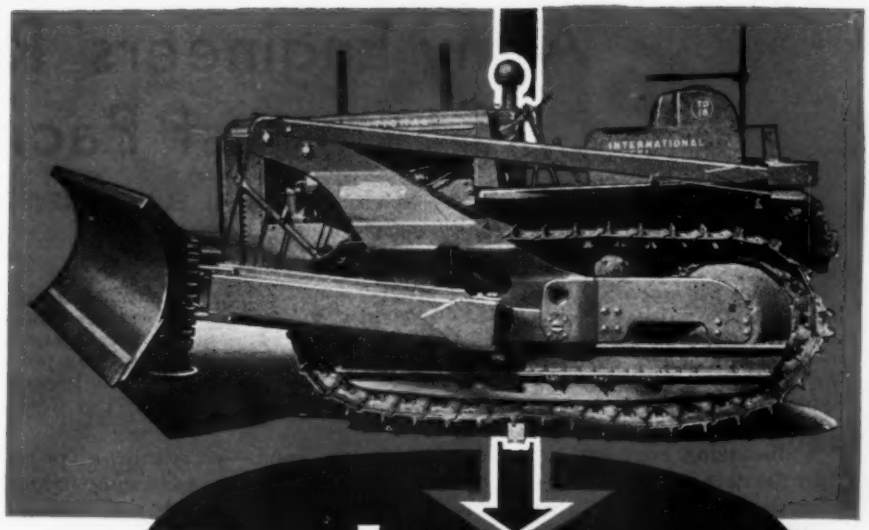
"The association is at work with other organizations and with government agencies working out policies and procedures through which the capacity for achievement and efficiency which has been attained by construction management can still be available during the war period.

"At the same time the association is working with others toward a step by step return to normal activity as soon as conditions permit. Means of cooperation are being established between groups within the industry and the government for the relaxation of government restrictions on construction in an orderly manner."

1944 officers will be installed Feb. 8. William Muirhead, president, William Muirhead Construction Co., Durham, N. C., is president nominee; Harry A. Dick, pres. of Gilpin Construction Co., Portland, Ore., vice president.

Women Work on Erosion Control

A crew of five women was employed last year by the Indiana highway department to plant grass for erosion control in Carroll county. They spent two months, planting several miles of right-of-way. The ground had been plowed and disked, before the all-woman crew took over, and they finished the job, which included raking, sowing and spreading hay over the freshly planted shoulders and back slopes. One drove a truck, from which several hundred tons of hay were pitched by the others. Said highway officials: very satisfactory workers.



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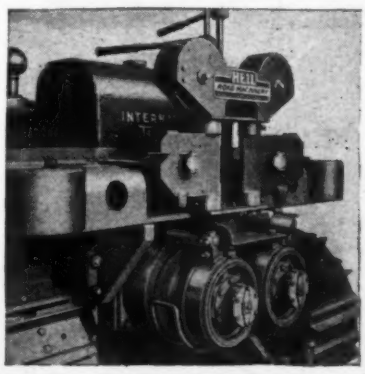

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Army Engineers' Role in Southwest Pacific

By MAJOR GENERAL EUGENE REYBOLD
Chief of Engineers, U. S. Army

Dwarfing all other engineering and construction work today is the task of the Corps of Engineers. In its ranks are buddies from road contracting organizations and highway and street departments everywhere—plus brilliant newcomers whose experience will be needed in the big post-war road building job. The following summary was presented at a recent editors' conference in Washington.—Editor.

IN discussing engineer equipment in theaters of operations—in particular the South and Southwest Pacific, from which I have just returned—we must first clearly understand the diversified tasks which constitute the Engineer's mission. This mission we must then fit against the tremendous time-consuming distances that exist in the Pacific, and the geological and physical conditions with which we are confronted out there. Only then can one begin to appreciate the magnitude of the job that exists and lies ahead for Engineers and Engineer equipment.

Immediately after Pearl Harbor, it was up to the Engineers to pioneer the air-lanes to the South Pacific, an island-hopping construction job extending half-way around the world. Landing strips and landing fields, scores of them, had to be built, and we are still building. Supply roads—whether they connect the "end-of-rail" in Canada with an Alaskan base of operations (as in the case of the Alaska Highway) or whether they are mucked through the South Sea jungles, or bulldozed over the hot African sands—constitute a prime mission. The ever advancing fighter and bomber fields simply mean a repetition of more of the same.

Airport operations mean petroleum distribution and this in turn means the location, construction, operation and maintenance of military pipelines for supply of fuel in theaters of operations. Moreover, water must also be found, purified and distributed to all units. The countless airfields must be built in short time under the toughest of conditions.

Major General Eugene Reybold

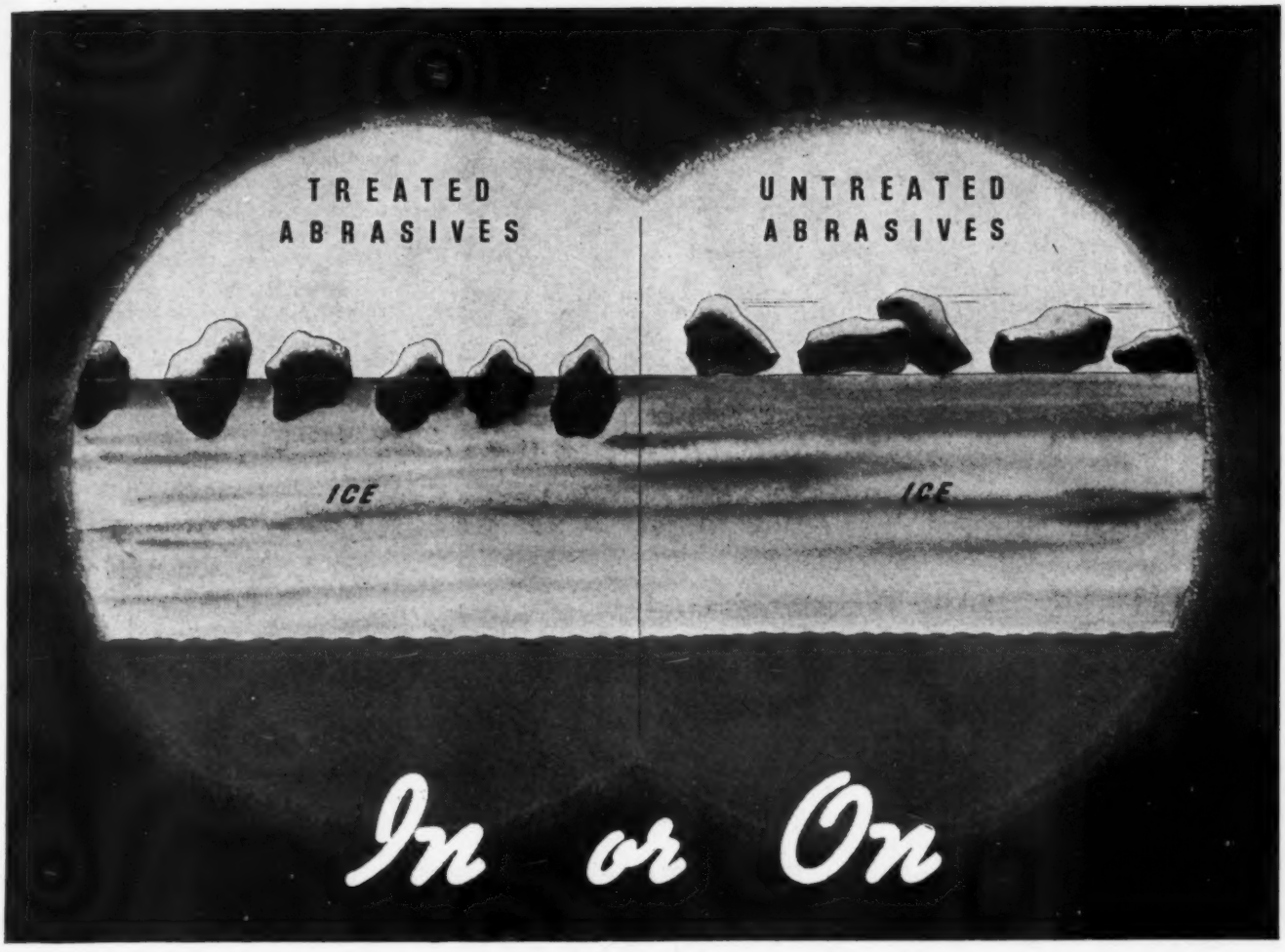
Engineer Troop Organization

Engineer troops serve with Air Forces, Ground Forces and Army Service Forces. Combat battalions serve with infantry divisions, airborne divisions and armored divisions. Engineer work is performed by general service regiments, aviation engineer battalions, water supply battalions, topographic units, ponton units, camouflage units, maintenance and bridge units, depot units and amphibious units; supply units, trained for the performance of special technical Engineer tasks include port construction and repair groups, fire-fighting battalions, utilities detachments, gas-generating units, and forestry battalions.

The mission of the amphibious Engineer is to transport combat units onto beaches in the assaults, evacuate wounded, handle prisoners, salvage equipment and supply combat troops. Our combat forces having once gained a beach head, the Amphibian Engineer units join hands with other Engineer units in the establishment of road communications and in the development of unloading and distributing points.

Then we must supply shelter as

Building-pass and dispersion areas for bomber strip on Espiritu Santo, New Hebrides.



The Measure of "Grip" on Icy Roads

When grits lie loose on the ice to be easily brushed or blown away, they cannot do an effective or lasting skidproofing job. But when abrasives are treated with calcium chloride, they melt themselves into the ice, anchor themselves and really put teeth in the ice.

Automobile skid tests made under impartial supervision show that ½ lb. of abrasives, treated with calcium chloride, is as effective as 1½ lbs. of untreated abrasives. By saving two-thirds of your abrasives you save two-thirds of the cost of getting them out of the pit, putting them in piles, loading and spreading them. This means a two-third saving of manpower, equipment, tires and gasoline — all critical items in the war program. Start now to save. Write for our Bulletin No. 27 "Skidproofing Icy Roads and Streets."

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Gears Icy Roads to Tires

A bulldozer driver with the Engineers on New Georgia keeps one hand on his rifle. Note the patched bullet holes in the gas tank. Bulldozers were used as "points" for advancing jungle columns

well as certain utilities and incidental installations. So rapid had been our advance and so tremendous the job in the South and Southwest Pacific, that fixed shelter is either non-existent or in a very primitive condition.

The Engineer's task is *never* done. To illustrate—one Engineer general-service regiment I encountered helped build the Alaska Highway, then built offensive installations clear out to the end of the Aleutians, and finally sailed 23,000 miles to the Southwest Pacific to tackle jobs out there.

I think General MacArthur summed up the situation during our conference on this last trip when he said, "Reybold, this is an air and amphibious war; because of the nature of air and amphibious operations, it is distinctly an Engineer's war. Never before have Engineers played such an important role."

The Jap strategy has been to infiltrate into the jungle, carrying the lightest possible equipment, dig himself in and prepare to hold his position. He was led to believe that heavy equipment to build continuously advancing airfields and roads for artillery could never be brought to bear against him in the jungle. In that, he made an error.

Heavy-Equipment Job!

The kind of operations I have described necessitate heavy construction equipment and all we can get. Not only must all of this be manufactured in the U. S. and transported to Pacific bases, but it must be shared with our Allies around the globe whom we are supplying. Even though we are procuring and distributing practically the total out-put of this class of equipment, there is *still* not enough of it to go around.

Foremost among the items of heavy equipment is the bulldozer. This is the all-round favorite because it does more things well than any other machine and it is even difficult for Japanese pillboxes and machinegun emplacements to stop it.

Shovels, draglines, cranes, pile-drivers, well drilling rigs, pumps, dump trucks, rollers, graders, rock crushers, and paving machinery are also necessary for specialized work.

American Engineers and manufacturers have developed and perfected small models of the essential earth-moving equipment in order that it may be carried forward rapidly by air to perform initial work on advance air strips. Furnishing and placing of steel landing mat is of utmost importance. As time permits, it is replaced by asphalt or concrete.

Maintenance

And all of this equipment must be kept in good running order. Hence, we have specialized maintenance and shop units as well as depot units from which spare parts must flow to the right place at the right time and in sufficient quantity. Both men and machines work three shifts around the clock.

Also there is the question of maintenance and repair of facilities that have been constructed; these include airfields, roads, ports and all manner of military installations and the utility systems that go with them.

Build—and Rebuild

We must finally examine another element of utmost importance. That is the tremendous—yes, unbelievable—distances in the Pacific theaters. Most points are separated by water. Each time a new island is taken it must be within range of fighter-escorted bombers for air control. After we land and utimately drive out the Japs, we must build all of these establishments over again—airfields, docks, roads, water points, storage space—before we can move against the next objective. All these advance operations are subject to enemy action, which means sudden destruction in addition to the abnormal wear and tear already suffered by the equipment.

ASCE Committee Formula for Gauging Post-War Porgress

The Amer. Soc. of C.E.'s Committee on Post-War Construction recently determined that some approved method of gauging progress of planning post-war construction was needed. The Committee adopted the following formula for this purpose, as a step in the right direction:

Idea Stage—Projects known by name and description only, being visualized by various proponents or are pictured in the form of sketches, but no basic engineering studies made.

Report Stage—Projects crystallized to a point where an engineering report is being or has been prepared covering scope and need of the project, general layout, preliminary estimate of cost, and similar data.

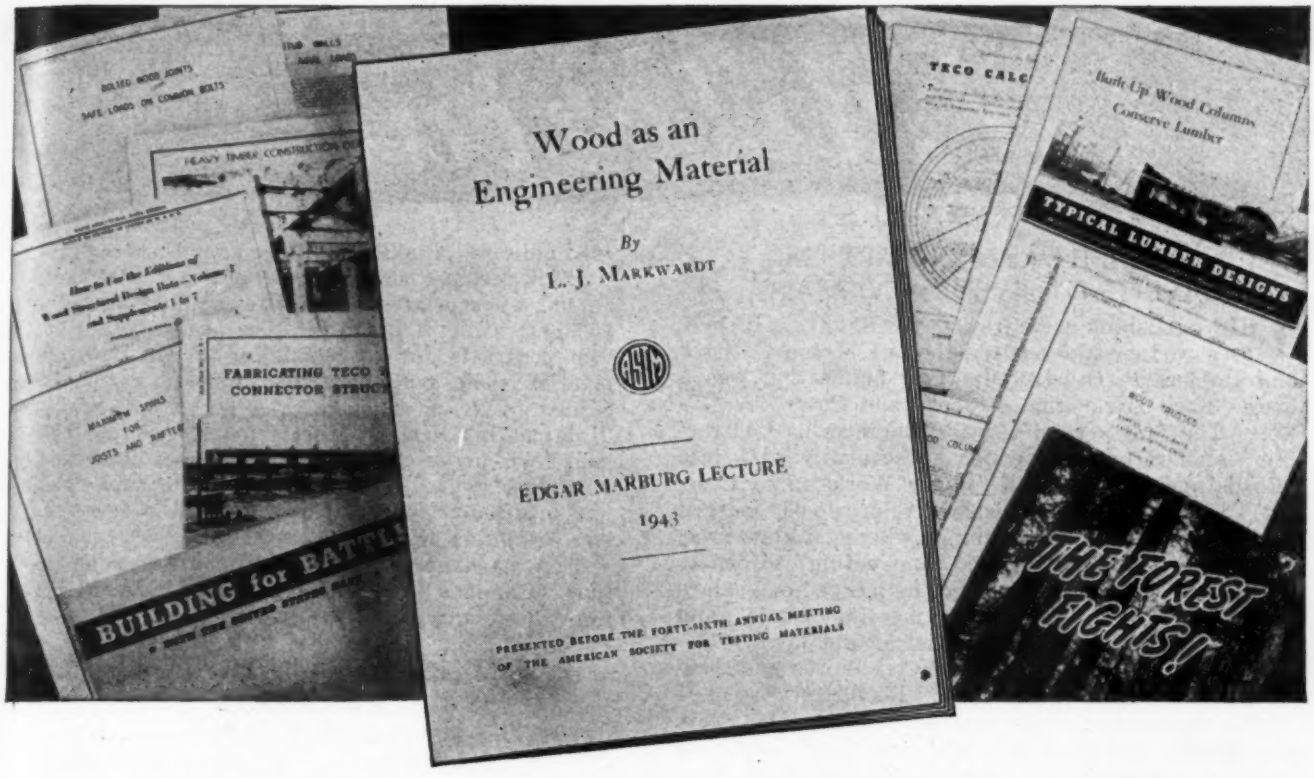
Design Stage—Covers specific projects for which complete surveys, borings, soundings, etc., are being made, land acquisition maps are being prepared, and on which plans, specifications and contract documents are in process of preparation, etc., as a basic for securing bids.

Completed Plans Stage — Covers projects on which plans, specifications and contract documents have been completed and laid aside to be used at the opportune time for securing bids.

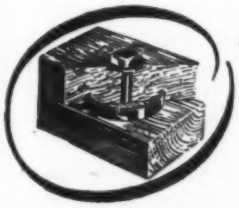
Bidding Stage—Plans, specifications and contract documents for bidding completed, all necessary rights-of-way secured, necessary funds authorized and allocated by proper authorities.

$204,000,000 in Road Funds Diverted in 1942

Diversion of highway funds to non-highway purposes accounted for $204,165,000 of receipts from state imposts on highway users during the calendar year 1942, the Public Roads Administration reports.



BASIC TIMBER ENGINEERING DATA FOR ARCHITECTS AND ENGINEERS



"WOOD as an Engineering Material," by L. J. Markwardt, distinguished research authority of the U. S. Forest Products Laboratory, was presented at the invitation of the American Society for Testing Materials as the 1943 Edgar Marburg Lecture.

The purpose of this annual lecture is to present outstanding developments in the extension of knowledge of engineering materials.

In continuation of Teco's practice of making latest information on timber available to engineers and architects, copies of this lecture have been obtained and are available on request.

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Editorial

FORTIETH ANNIVERSARY OF GILLETTE PUBLISHING COMPANY

THIS publishing organization had its origin in 1904 as a partnership between the late Myron C. Clark and Halbert P. Gillette. Its first publication was a book, "Rock Excavation Methods and Costs" by Gillette. The first periodical was "Engineering-Contracting," started in 1906, which subsequently split into "Roads and Streets" and "Water Works and Sewerage." Several other periodicals were previously merged in "Engineering-Contracting," whose name was changed to "Engineering and Contracting" to denote the broader field thus covered. The merged magazines were "The Dirt Mover," "Engineering World" and "Contract News." Later "Municipal and County Engineering" was merged with "Water Works and Sewerage," and "Good Roads" with "Roads and Streets." Hence the present two magazines are mergers of six periodicals. "Water Works and Sewerage" has been under the editorship of Linn H. Enslow since 1931, during which time it has attained leadership in its field.

Myron C. Clark was manager of the technical book department of "Engineering News" when Halbert P. Gillette was an associate editor of that journal. Clark asked Gillette whether he could write a book on Earthwork. Gillette hesitated until Clark added that there was no book on the subject. Since even a poor book would be better than none, Gillette undertook that authorship job. The large sale of the book having proved the soundness of Clark's judgment as well as his ability as a salesman, led Gillette to suggest a publishing partnership. So the two began business in 1904 in a 12x12 office in the Park Row Building, New York City, with a cash capital of about $500.

In order to earn a living during the early stages of the publishing venture, Gillette entered into another partnership with the late George H. Gibson, as an advertising agency whose slogan was "Technical Advertising by Technical Men."

In 1906 Gillette became the first chief engineer of the Washington Railroad Commission and appraised all the railways in the State of Washington. When that task was undertaken Charles T. Murray took Gillette's place as managing editor of "Engineering and Contracting," a position that he still holds on "Roads and Streets." Murray had also been an associate editor on "Engineering News," a journal that was an editorial training school for many other engineers.

Incidentally it is just 70 years since "Engineering News," now "Engineering News-Record," was founded by the late George H. Frost. Its early issues were published in Chicago, but as New York City was then a better center for the publication of a national engineering magazine, Frost soon moved to New York. "Engineering News" was the first general civil engineering magazine in America.

"Good Roads," the first highway magazine, was founded by the late E. L. Powers, in 1892, a few years before any American state began extensive building of roads. It was not till 1898 that the New York State legislature enacted a bill for "state aid" in road building. Public ignorance as to the need of such "aid" is perhaps best shown by the fact that the first annual appropriation for state roadwork was only $50,000! Gillette Brothers were awarded one of the first contracts for road building under that appropriation. The experience thus gained was partly recorded by H. P. Gillette in a series of articles in "Engineering News." Those articles were reprinted in book form under the title of "Economics of Road Construction," which event may be said to have "cleared and grubbed the right-of-way" for the present magazine known as "Roads and Streets."

This magazine now has a Spanish-American prototype, "Caminos y Calles," founded by Edward Scranton Gillette and edited by John C. Black.

SPOT-LIGHT ON INTER-REGIONAL HIGHWAYS

SOUND post-war highway development on a large scale came another step nearer with the unveiling of the long-awaited report of the National Interregional Highway Committee. In submitting this report to congress the President made front-page news with a proposal for $750,000,000-a-year development of a national highway system of 34,000 miles "essential to the future economic welfare and defense of the nation."

All and all it was a big week for American motorists. The Saturday Evening Post of January 15 broke with the same story in Boyden Sparkes' article "Our Highways Are Antiques." (If you are a highway or municipal engineer, official or contractor, read this article! And pass it along!)

Naturally the President couldn't get too specific but he did urge early congressional action to authorize joint designation of routes to enable us to get started acquiring right of way. In putting his finger on this most important preliminary job he suggested that actual routes be left fluid or undecided at first to discourage speculation in right-of-way land prices. The cheapest in relation to right of way to be the final choice.

Basis of the President's recommendations, the committee's report "Interregional Highways," is indeed a remarkable document. In preparation since 1941, its 175 pages render a priceless service to the cause of highway advancement by dispelling any remaining wild dreams of uneconomic transcontinental superhighways. Its graphs and charts based on a great mass of traffic data show that arterial traffic is largely local. The biggest job is to streamline the flow into, out of, through and around large cities, with expressways where justified.

Briefly what does the proposed Interregional System comprise? Its 32,920 miles of recommended routes (including 4,470 miles in cities) connect *all* centers of 300,000 population or larger; reach 59 of 62 cities of 100,000-300,000 size; 82 of 107 cities of 50,000-100,000; 121 of 213 places of 25,000-50,000; 45% of the 10,000-25,000.

(*Continued on page* 93).

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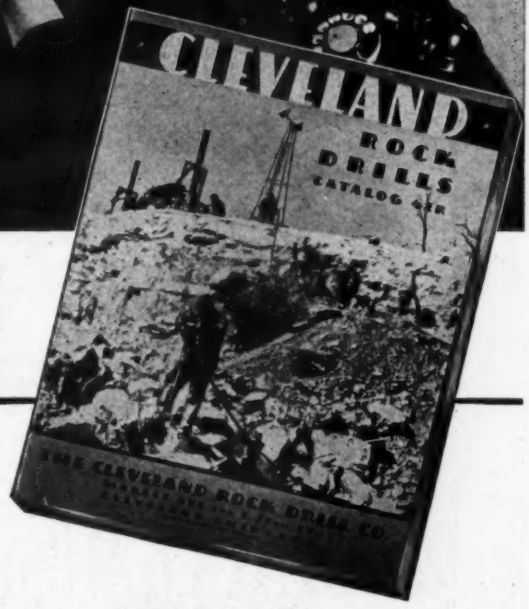

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LEADERS IN DRILLING EQUIPMENT

Meet Hal Hale

New Executive Secretary of American Association of State Highway Officials

AFTER you have spent an hour with Hal Hale you will feel as though you have known him all your life. He's that kind of a guy. The ancient pipe he leisurely packs and smokes as he talks gives forth personal charm while he imparts philosophy, history and other bits of wisdom—or the facts you want to know.

It's this kind of a solid citizen as well as an able executive and engineer who has stepped into the shoes of W. C. Markham, who served as AASHO's executive secretary for many years with distinction and is now executive secretary emeritus.

Mr. Hale is a comparative youngster who started his career in 1920

Hal H. Hale

by entering the University of Tennessee, where he was graduated in 1924. He served in various positions with the City of Knoxville. Also briefly with the U. S. Engineer Department in aero-topographic surveys of the upper French Broad River.

Then for a year he further rounded his experience, as a resident engineer for J. B. McCrary Co., Atlanta, on sewers, paving and other municipal work.

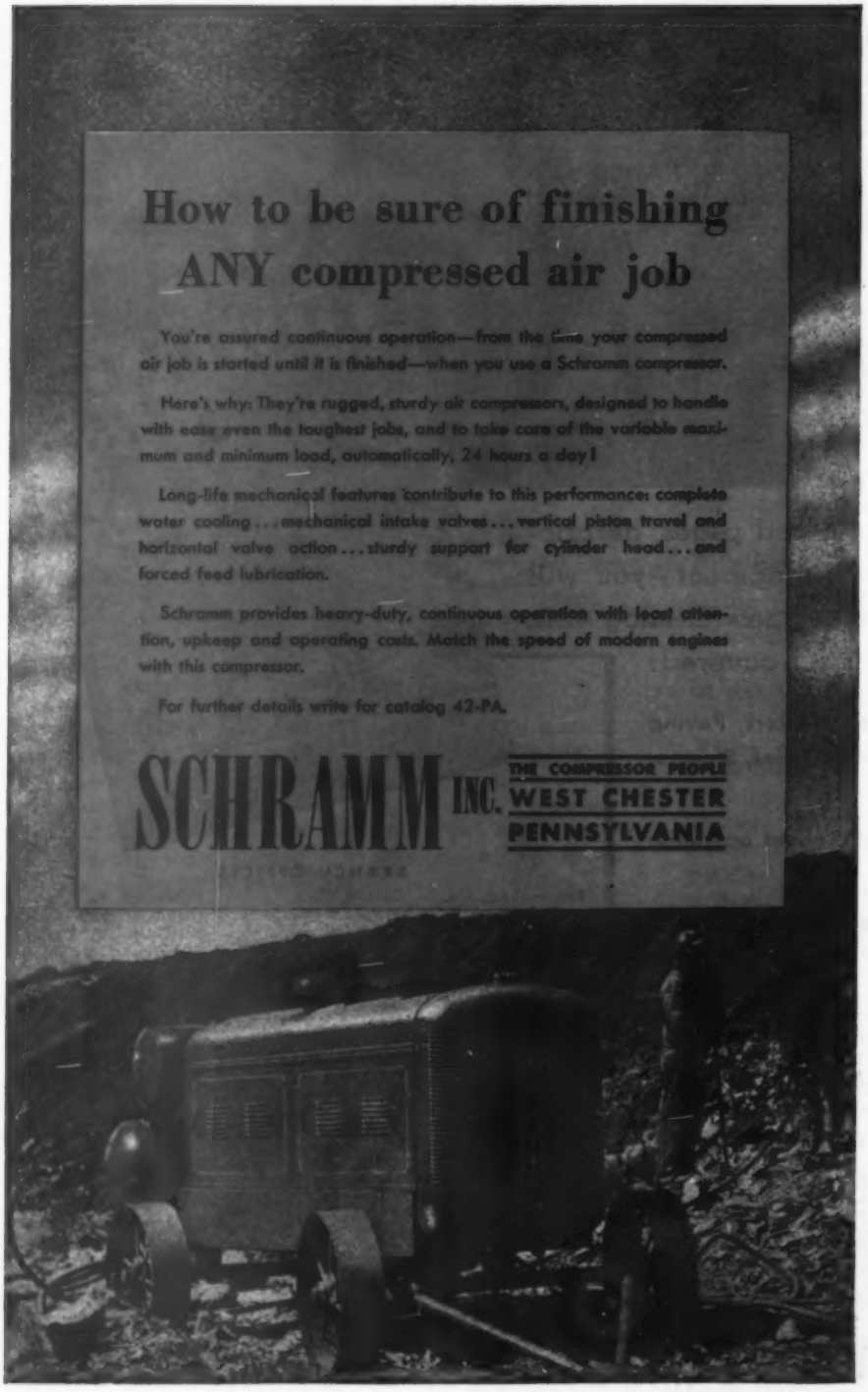
Back to Knoxville (they seem to like him there!) he served from 1926 to 1938, advancing from designer to office engineer and holding the job as city engineer for five years, during a period of widely diversified municipal improvement activities.

In 1938 Mr. Hale joined the Portland Cement Association as Office Engineer, Atlanta District.

By this time his reputation as a "man to watch" had spread and in 1941 he was appointed assistant to the secretary and Washington representative of the American Society of Civil Engineers, in which position he soon gained a reputation for his knowledge of Washington affairs.

Hal Hale is a licensed engineer, state of Tennessee. He has found time in his busy life to serve as president of the Knoxville Technical Society; sec.-treas. Tennessee Valley Section of ASCE and as vice-pres. and later pres. of the Georgia section of ASCE.

The American Association of State Highway Officials is mighty fortunate in having Hal Hale as its Executive Secretary.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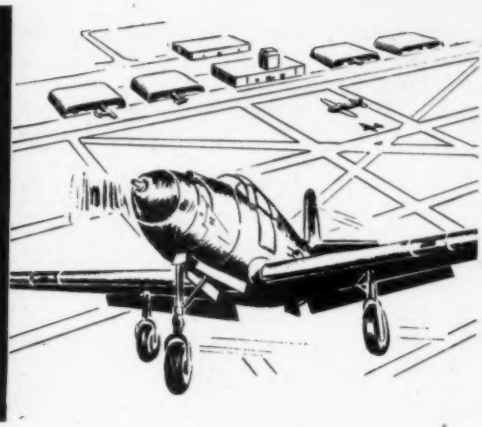

Grace Sweepers and Heaters Provide Speed and Economy

Axle driven, motor driven, or front end tractor sweepers for construction and maintenance of asphalt and other pavements. Also use them for—sweeping light snow from sidewalks and roads.

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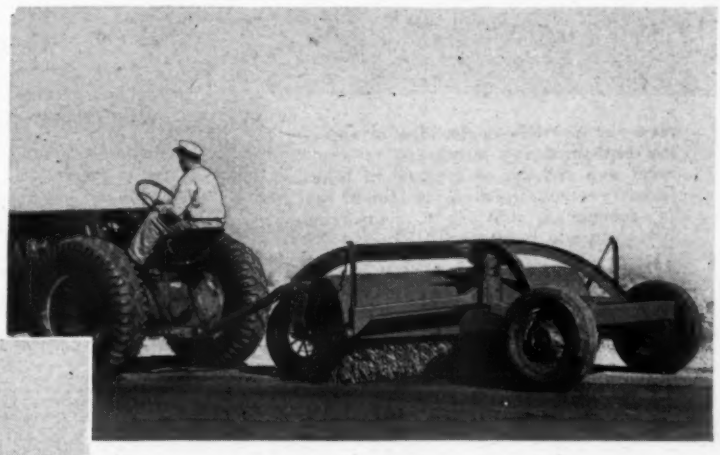

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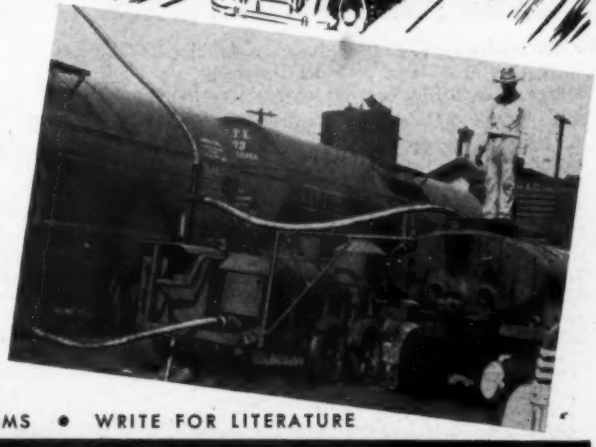
Rapid Fire Circulating Heater for Tank Cars of Asphalt

Heats and loads any type asphalt at pumping rates up to 250 GPM. Temperatures up to 450°. The heater with flues DESIGNED for heating asphalt—not a converted boiler. Built-in steam generator for thawing cars of asphalt that arrive below pumping temperature.



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W. E. GRACE MFG. CO.

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Contractors at Work

—OHIO ACCESS ROADS

Scenes Snapped by ROADS AND STREETS Editors During '43

New—or isn't it?—is the idea of applying asphalt curing membrane to abutment wall surfaces on removal of forms in hot weather. Used on the Horvitz job in connection with 76-ft. rigid-frame grade separation bridge

On the Horvitz Company's 1½ million dollar contract in Berea, Brookpark and Cleveland, past an aircraft assembly plant

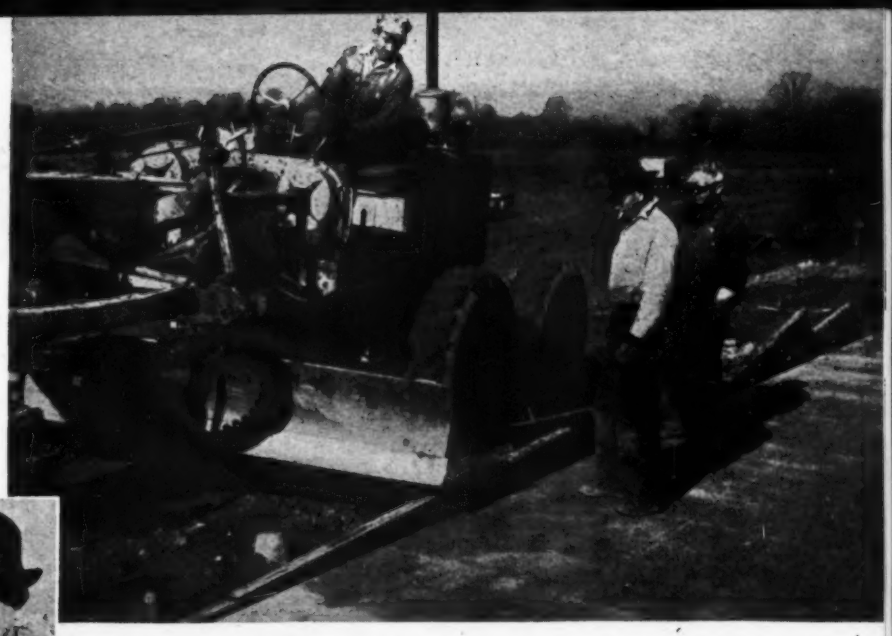
Characteristic of scrambled makes and sizes of equipment seen on wartime jobs is the outfit Horvitz had grading here for a semi-cloverleaf. Owned or rented units included 3 LeTourneau 15-yd. scrapers with D8 cats, two LaPlant dozers on D7 or D8 cats, one D7 caterpillar with LeTourneau dozer apron, a Cletrac 80 Diesel pulling a Heil 12-yd. scoop (shown), a 60 gas Cletrac with an 8-yd. Heil, an 80 Diesel Cletrac old-timer with Euclid dozer and sheepsfoot

Walter Anderson, project engineer on the Horvitz job, with Robert E. Willems, State hy. Div. Eng'r, and H. T. French, Asst. Div. Engr. in Charge Construction

Visintine & Co.'s $540,000 grade crossing elimination job along James Road, near Columbus, O.

(Right): Driving and cutting off shells for concrete piling, grade separation abutment. (Below): C. C. Hurlbut, project engineer; J. A. Visintine, of contracting firm; Leo Hirsch, asst. engr.; and J. J. Visintine. (Interesting job note: "Sidewalk superintending" here day after day last summer was an elderly semi-retired physician, whose hobby was to sit on a fence or barrel and watch by the hour, sometimes lending a suggestion or two. A personal friend of the contractor, it was said)

The A. J. Baltes contract near Akron—divided 4-lane relocation of U. S. 224 past the Goodyear aircraft plant



(Below): On the Baltes job near Akron—Wayne Cronk, gen. supt.; L. W. Hine, project engineer; Wm. Wardman, Ohio division construction engineer

Baltes' patrol grader lends a hand, pulling forms with lifting bar hooked over the blade

Baltes had to figure a paving sequence past the Goodyear plant to assure 2-way traffic at all times. Note here that inner 12-ft. lane has been put in service while finegrading crew is busy on outer lane. This project reflects Ohio wartime design practice in that Vinsol Resin plain concrete of 9 in. uniform thickness was used, in this instance over 8 in. compacted ballast subgrade. 12½-ft. max. lane width was specified

Thorpe Construction Co.'s widening job, on South Arlington St., Akron

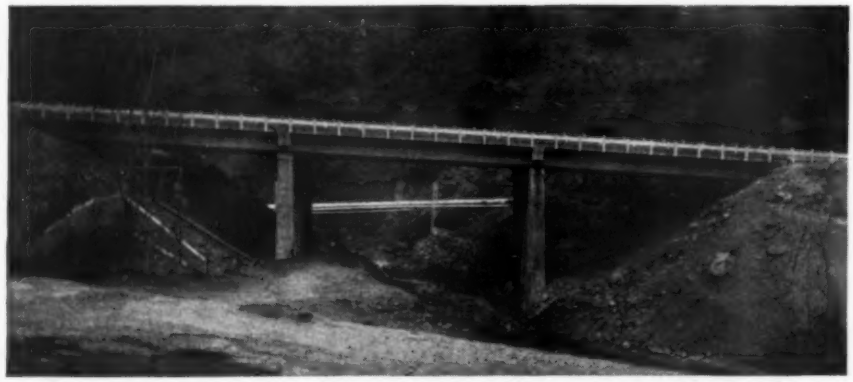
(Below): On the Horvitz job with alemite outfit

(Below): A small bulldozer made short work here of backfilling for a sewer extension, over which the new widened 4-lane Arlington St. has since been completed. The operator first nosed the dragline-excavated material laterally into the trench, then spread and helped compact it by successive passes along the trench

Concrete Bridge Deck Reinforced 100% With Scrap Rail

High-carbon rails were annealed in "barbecue pit" to adapt them to welding; an example of ingenuity in design and construction under wartime restrictions

NOT a few concrete bridges have been reinforced in part with old railroad rail since the war restrictions on steel. A recent bridge widening job, on Grapevine Creek in Kern County, California, has the distinction of having the deck reinforced entirely with scrap rail. Eighty tons of rail was utilized in constructing three 67 ft.-1-in. two-lane deck widening spans.



Not a pound of reinforcing rod. Deck and pier stresses are taken 100% by pieces of scrap rail

The old bridge to be widened is a two-lane steel deck girder structure. Normally it would have been widened by placing additional steel girders, or, if concrete was desired, with a deck of typical T-beam construction. However, to utilize an available supply of scrap rail and eliminate need for other stress steel, a filleted or arched cross-section was adopted (See Fig. 1), which would lend arch action in conjunction with transverse lines of curved rails placed in the position shown, of necessity representing a somewhat empirical stress design. Computations called for rail at a minimum spacing of 22 inches affording at least 1.5 sq. in. of steel cross section (A_s) per lineal foot of deck.

The tension steel in the bottom of each "T-beam" consisted of 12 lines of rail, placed in three tiers.

Split Rail Shear Bars

Even the shear reinforcement was scrap rail; lengths of split rail were welded in pairs to the longitudinal rails and thus held in position to serve in lieu of conventional stirrups or bent-up bars. And rails were also used for the transverse bottom reinforcing in mid-span and end diaphrams. Wire mesh on hand in the district state maintenance yard was placed near the face of all under surfaces.

Deck expansion was provided by rockers at end-span pier supports. Rockers, likewise, were designed to utilize rail. As shown in Fig. 2, three lengths of rail rest one on another. The upper rail is embedded in the deck concrete, the lower in the pier concrete, the middle rail taking up expansion movements by rocking on the worn rounded railheads. Rail heads not sufficiently rounded from use were specified to be ground to a

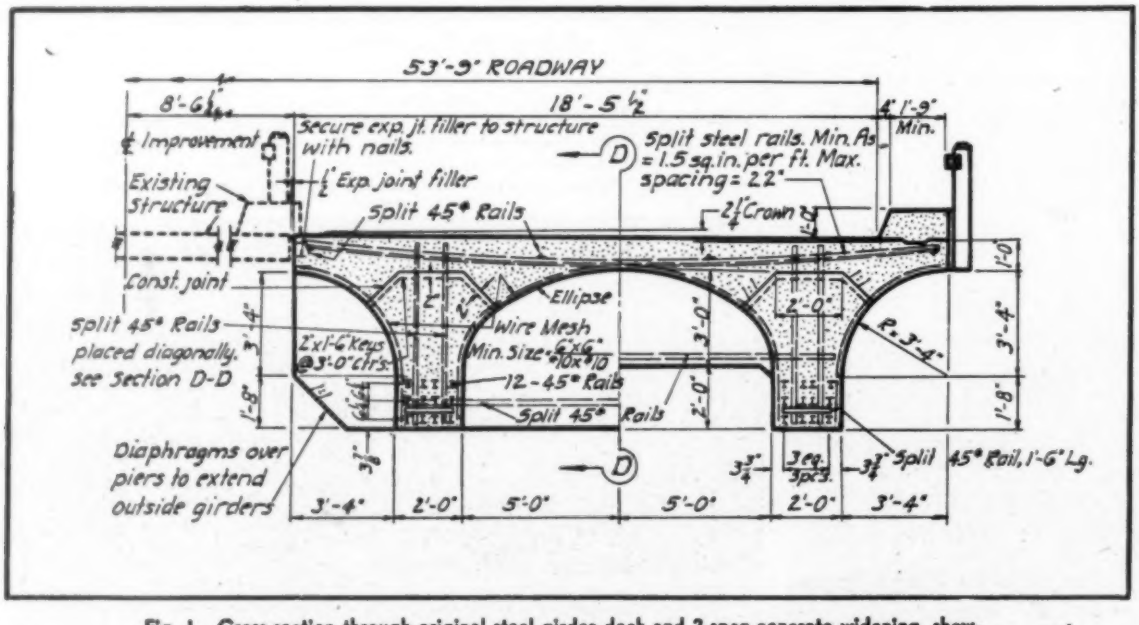


Fig. 1. Cross-section through original steel girder deck and 2-span concrete widening, showing general scheme of rail-reinforcing

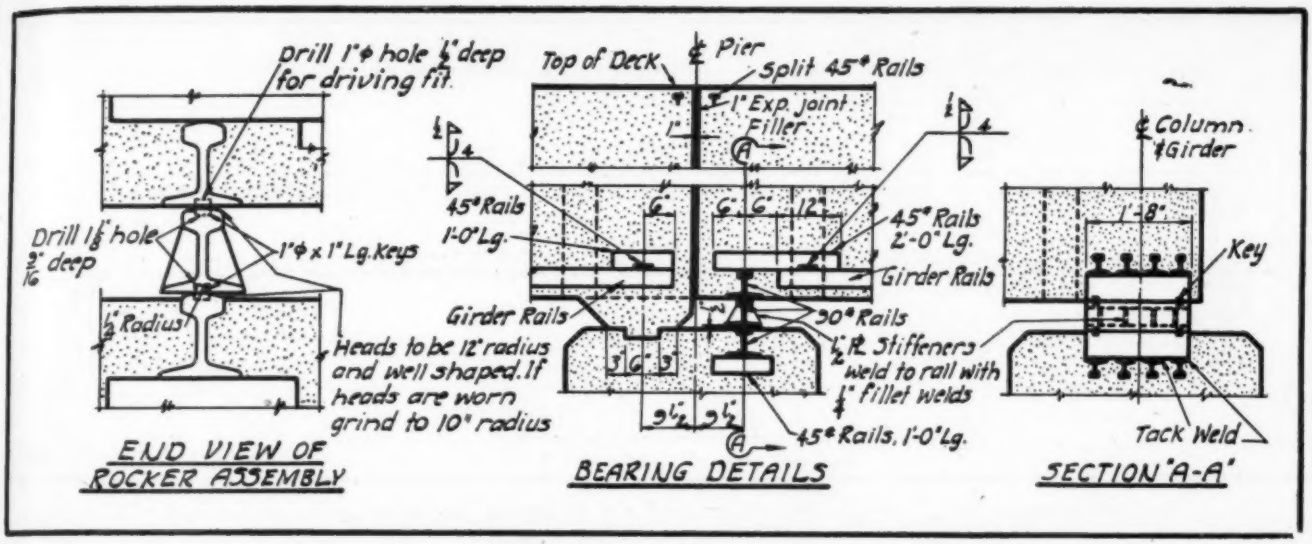

Drill 1"ϕ hole ½" deep for driving fit.
Drill 1⅛" hole 2" deep
1"ϕ x 1" Lg. Keys
½" Radius
Heads to be 12" radius and well shaped. If heads are worn grind to 10" radius
END VIEW OF ROCKER ASSEMBLY
Top of Deck
℄ Pier
Split 45° Rails
1" Exp. Joint Filler
45° Rails 1'-0" Lg.
45° Rails 2'-0" Lg.
Girder Rails
30° Rails
½" R. Stiffeners weld to rail with ¼" fillet welds
45° Rails, 1'-0" Lg.
BEARING DETAILS
℄ Column & Girder
1'-8"
Key
Tack Weld
SECTION "A-A"

Fig. 2. Details of rocker assembly

10-in. radius. The rails in the rocker assembly were keyed to each other by means of steel plugs driven to a tight fit in 1 in. round holes.

Tension rail in the beams are staggered at panel ends, to make room for embedded rail, as detailed in Fig. 2.

This design saved money as well as reinforcing steel in construction. Early difficulty in working concrete around the 12 rails in the bottom of the form was soon eliminated by careful use of a hand vibrator. An interesting detail was the heat treatment of the high-carbon rails to adapt them to welding.

How Rails Were Split and Annealed

The rails were "barbecued" in pits, with oil burners that brought the metal to the desired temperature.

The rail to be split was placed on a splitting table composed of two 45-pound rails, one with the flange up and the other on its side, welded together with short ¼x2-in. straps.

The rail to be split was placed on its side with the head fitted into the web of the up-side-down rail. After this rail was clamped into position, the cutting bug was placed on the table so that its traction wheel rode on the upside-down rail and its guide wheels rode on the flange of the other table rail. The cutting torch was mounted vertically on the bug and had no horizontal adjustment.

The cutting bug was motivated by an electric motor geared to the traction wheel.

After the rails were split, they were lowered into the adjacent annealing oven with an electric-powered cable winch.

The annealing oven was 3 ft. deep, 3 ft. wide and 32 ft. long. Each side of the pit was lined with five full length rails which were supported by 10-ft. lengths of pipe driven alongside of them. The tops of the pipes were anchored to deadmen away from the pit.

The pit had a capacity of forty 30-ft. long rails, and after loading, was covered by short pieces of rail, sheet metal and one foot of earth. A 12-in. diameter sheet metal stack, 10 ft. high was provided in the center of the cover, along with 4-in. inspection holes at each end of the oven and at each side of the stack.

Blast chambers were provided at each end of the pit and in the back wall of these were set Ray type "A" oil burners. The front walls were baffle walls made up of round terra cotta blue lining.

An average of 14 hours was required to bring the rails to a cherry-red heat throughout their length. Then the oil burners were turned off and the rails allowed to cool in the pit until they could be removed by hand without danger of burning hands or clothing. The average time for this cooling was 60 hours.

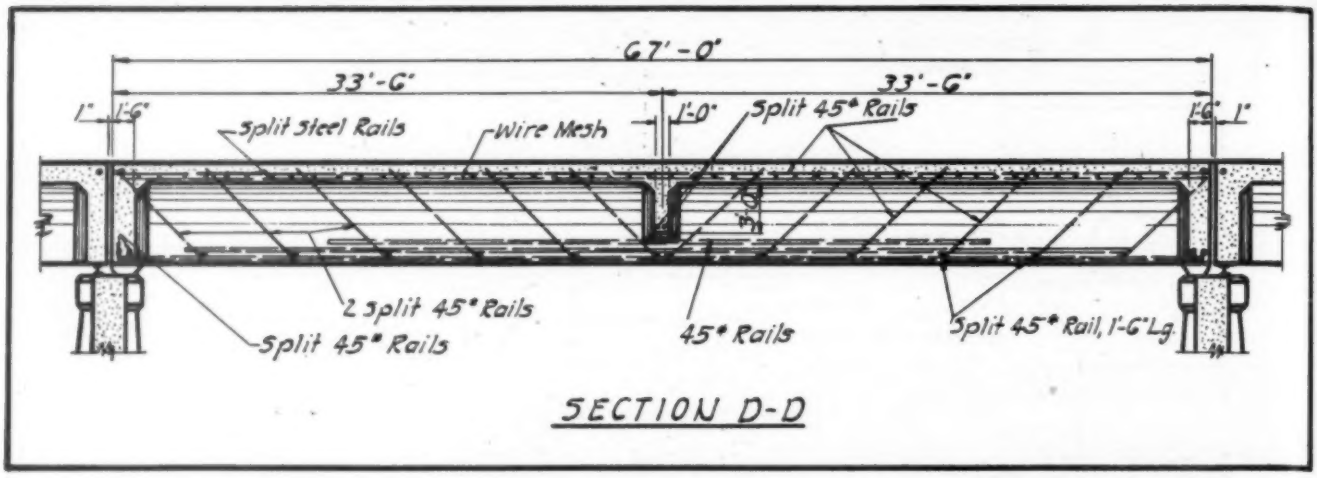
After normalizing was completed, the rails were steam-cleaned with a mixture of water and 4 per cent Sal Soda, wire brushed and again steam-cleaned.

Piers Also Rail Reinforced

The two open-type concrete piers and footings were also reinforced with lengths of old rail and wire mesh. Each 48-ft. pier column contained eight vertical rails. Tie beams are rail-reinforced, and footings have rail dowels and grillage. Abutments, being of shallow gravity design, are unreinforced.

This bridge widening, which is on

Showing how steel deck girder bridge was widened to 4 lanes using concrete T-beam construction



Showing arrangement of diagonal shear bars, consisting of pieces of rail welded to bottom and top steel

the heavily traveled main route between Bakersfield and Los Angeles, is designed for an H-20 loading. Construction was performed by contract, the job being completed in April, 1943, by Trewhitt, Shields and Fisher of Fresno, Calif. The project was designed and supervised by the bridge department of California Division of Highways, Geo. T. McCoy, state highway engineer, and F. W. Panhorst, bridge engineer.

Illinois Highway Construction in 1943—A total of 421 miles of paving of all types was completed on the Illinois state highway system last year. The work included 27 bridges, seven railroad and two highway grade separations. The construction expenditures amounted to $21,300,000.

Monumenting Rural Right-of-Way

By JOHN M. ROTAN
Ohio Department of Highways, Cleveland

Some of the southern states, notably Texas, have adopted a system of monumenting which could be used advantageously on rural and suburban roads generally. Concrete monuments are used, 4 ft. long, 8x8 in. at base and 4x4 in. at top. Edges, except of the base, are chamfered ½ in.

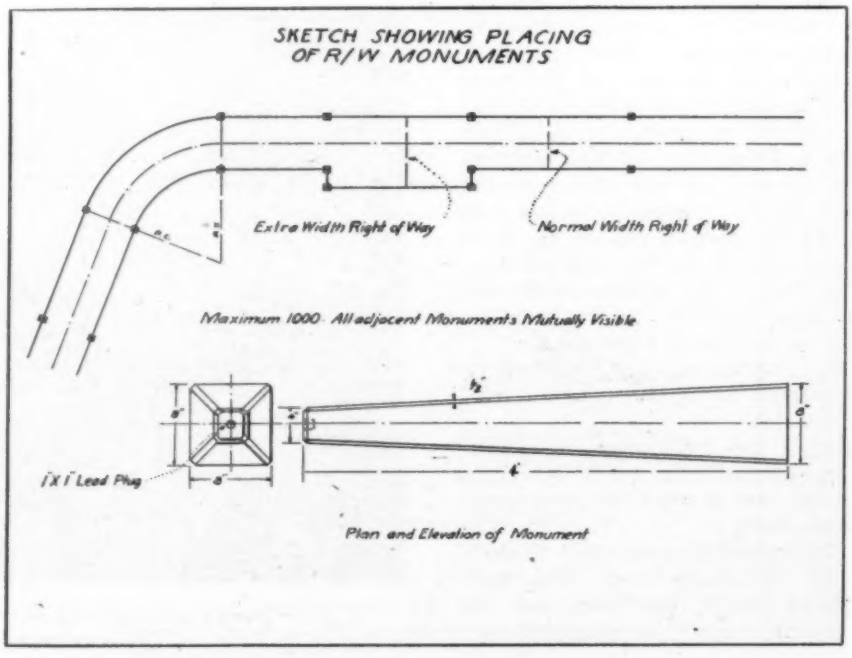
The monument has a hole 1 in. in diameter by 1 in. deep in the center of the top, in which lead is poured to be marked with a hub tack or center punch for point.

These monuments are set at intervals along the right-of-way not to exceed 1,000 ft. and along the radial lines of curves at P.C.s and P. T.s, in pairs opposite at 90° to centerline of road. In cases where the right-of-way is widened for any purpose such as extra broad cuts, fills, borrow pits, etc., monuments are set at the corners of such extra areas. To obviate the necessity of separate surveys for monumenting, extra hubs are set in line with reference hubs at points where monuments will be set. By use of a taut line and accurate measurement the tack point in monument is located from the hubs. These monuments can be used in the same manner as centerline monuments for finding the original location of the road, and as points from which to locate any work that may subsequently come up without exposing the survey party to the hazards of traffic.

Expansion and contraction of the pavement will not affect these monuments and they may be protected from disturbance in erection of fences and buildings by guard posts or otherwise. A further advantage of this system is the fact that the monuments clearly and permanently define the right-of-way limits of the road at all points. The monuments may be used also for vertical control, obviating the necessity of establishing a separate system of B.M.s outside the roadway proper.

The cost of this system of monumenting is very little if any higher than that of centerline monuments, and the extra cost is offset by the saving effected in resurveys that are always necessary on rural roads, since the work can be carried on outside the flow of traffic.

After using this system for a number of years, the writer has found it to be very practical and, in the final analysis, no more expensive than a less effective single line of centerline monuments, while giving many practical advantages over the single line system.


SKETCH SHOWING PLACING OF R/W MONUMENTS
Extra Width Right of Way
Normal Width Right of Way
Maximum 1000. All adjacent Monuments Mutually Visible
1"x1" Lead Plug
Plan and Elevation of Monument

How to Move Dirt Safely

Know your job and its dangers! If you want to live to a ripe old age, that's earthmoving rule No. 1. Today, when the supply of men and machines is so short, it's doubly important.

* * *

By PAT EDWARDS, Service Engineer
R. G. LeTourneau, Inc., Peoria, Ill.

STUDY your job and equipment before you start. Is the terrain level? Or is the ground hilly? Any soft-edged embankments waiting to trap you and your equipment? Are the favorable downhill loading or hauling grades likely to cause the tractor or Tournapull to cross-friction when steering? If such exists, how are the brakes and clutches? Are your lights in good working order, for early morning and evening hours, or all night operating? Is every inch of cable, each adjustment, safe and sound before you begin?

And once the job is started, are you constantly alert for developing danger signs? When operating conditions are not absolutely safe—stop, check and correct. It is vitally important that you do so—because YOUR life and limbs are at stake!

Park 'Em Right

From the first time you pull up to the job, stop your Scraper and crawl off, always immediately lower the Scraper bowl and apron to the ground. A machine thus parked is fairly safe against rolling, or being set in motion by the impact of other equipment.

If you are handling a tractor and Dozer, be sure to drop that Dozer blade to the ground. A later, unforeseen cable slip or break could easily leave you or your buddy standing in front of the Dozer—with the rest of a leg or foot on the back side, and an equipment operator's career shot to death!

Do not stand or sit in the front or rear of a parked machine; even a grounded bowl or blade might not hold the equipment steady if someone started it up unexpectedly. Remember, it is impossible for an operator to see at a glance all around his rig. Pleasant though it may be, sitting in the shade of your vehicle while you eat lunch could become a very natural prelude to "the condemned ate a hearty meal just before he died!"

Where's That Helper?

"A well trained employee is a safe employee," contractors are asked to remember. Often, because he is naturally so sure of himself, a superior or co-worker unwittingly fails to give the new man complete job information. A competent instructor should be assigned to all new employees until they thoroughly understand the working principles of their equipment.

Catskinners can never be told too many times to locate their helpers and other adjacent men and machines before operating.

In logging, demolition work and similar activities, operators and helpers certainly deserve protection from overhead dangers. Sometimes, before the tree falls before the dozer's blows, deadwood gives way above. "Good, old Canopy!" the protected operator will breathe thankfully, as the falling timber thuds down and off to the side.

Everybody connected with night work knows the importance of good lighting. Good lighting will keep your operator from careening off the end of a fill. He'll see other equipment and helpers, and avoid collisions. Proper illumination will afford safer traveling on bumpy or rutty jobs and haul areas.

Watch Those Parts

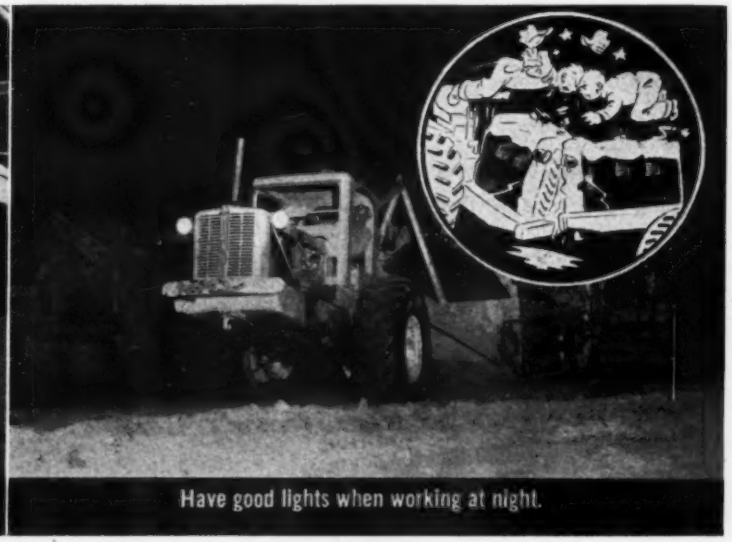
Like his brother in the factory, the man in the field must always remember the machine itself can be dangerous . . . Keep those hands away from cable, sheaves and other exposed, moving parts; be careful of loose clothing, waiting to drop into moving parts when you lean over!

In turning clutches to make adjustments, be doubly aware of the position of your hands and fingers. Use a bar of suitable length to twist clutch spiders. Stay wide-awake when tightening or loosening lock nuts and set screws. Do not, under any condition, engage the steering clutch when doing such work.

It's nice to have other fellows around, particularly if the operation might be a bit dangerous. If others aren't about when you undertake such work, wait! Or somebody may have to "undertake" you.

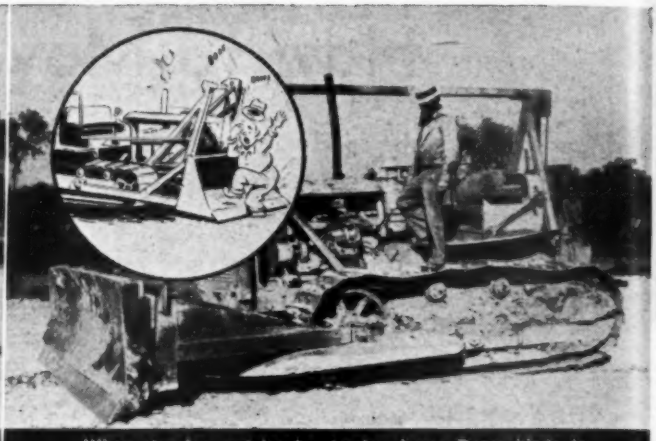
Never stand directly in front of a tire holding up a heavy load, or when you are filling it with air. That locking ring is not a part of the rim; even if the ring did miss you, a frontal blast from a blow-out could really muss you up.

Don't stand in front of tire with heavy load or when inflating as locking ring might blow off.

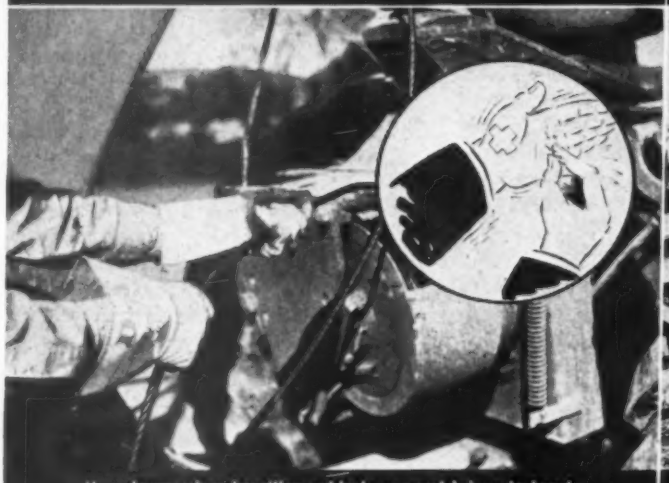


Have good lights when working at night.

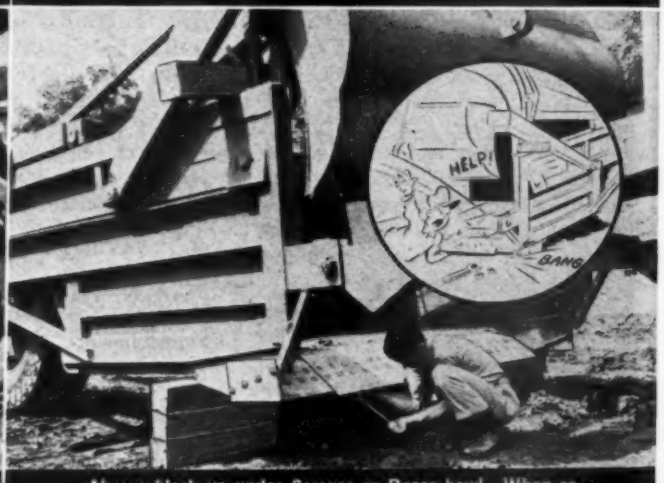
When working with a helper, watch him and know his whereabouts at all times.



When stopping and leaving tractor, lower Dozer blade to the ground.



Use gloves when handling cable to prevent injury to hands.



Always block up under Scraper or Dozer bowl. When replacing blades place blocks under apron arms.

How Do You Tow?

When you are towing that Scraper from job to job, always place a safety bolt in the pushbeam. This allows for maximum clearance of road projections. Too, the safety bolt avoids possibility of the cable breaking and allowing the bowl and cutting edge to strike the ground or pavement.

For similar reasons, be sure the clamps are properly placed when you tie two pieces of cable together. Improperly clamped cable is a danger source for everyone within a wide radius.

Stop That Engine

Going to make a Power Control Unit clutch adjustment? Then stop your tractor engine first! When working on the Power Control Unit, one is apt to forget that inside the case certain parts are moving if the flywheel clutch is engaged while the motor is running. The only way to be safe is to stop that motor.

The same thing is true when threading Power Control Unit cable. A stopped motor is always the safest assurance.

Gloves? They won't hurt your hands, and they will help a lot—particularly when you are removing worn, broken-strand cable. Even new cable can put severe burns on bare hands.

Keep your machine clean and you won't break your neck by slipping on greasy deck plates or steps choked with mud. Bottles, rags, etc., thrown beside the seat, can dislodge and jam steering linkage.

Safety on Cranes

The Crane, even in the earth moving field, is a funny bird. If you don't keep it secure, you can count on your load swinging while you travel. Further recommendation: keep your load as low as possible, and travel slowly.

Despite the obvious danger, you'd be surprised at the number of people who walk under suspended Crane loads! The results, of course, are sometimes pretty "flat."

Two Goals

Above all, remember this final, highly important safety rule—horseplay and earthmoving work just will not mix. Leave horseplay to the horses!

Earthmoving, despite the foregoing, is far from the world's most dangerous occupation. But, with the world of today and tomorrow calling for more earthmoving than ever before, we must remember that safety, for us, has two goals: It is humane—and it is the sign of every good operator, and his sensible, economical contractor.

"A little care and you'll live another day.

"A little carelessness and there goes all your days!"

Strip Film Illustrates Earthmoving Safety Points

"Safe Earthmoving," a strip sound film dedicated to safe earthmoving practices, furnished the illustrations accompanying this timely article. Like this story, the film is dedicated to the welfare of construction men. It is not directed to the safe operation of any particular make of equipment. The film is available for free loan, both domestic and export, through LeTourneau dealers everywhere.

CONSTRUCTION EQUIPMENT MAINTENANCE

A SPECIAL SECTION OF ROADS & STREETS

★ R. B. Tyler Co., Inc., Louisville, Kentucky, has the contract to clear, grub, grade, limerock base and pave the runways on this important airport project at Kinston, North Carolina. Every employee on this job is putting 10% or more of his pay into war bonds.

"GULF QUALITY PRODUCTS AND FINE SERVICE are helping us beat the schedule on this rush job"

. . . says Superintendent John Crockett

"We're getting top performance from every piece of equipment . . . and our maintenance costs are very low"

"Our fine operating record on this rush airport job is further proof to us that Gulf quality lubricants and fuels insure efficient and economical equipment performance," says Superintendent John Crockett of R. B. Tyler Co., Inc.* "And thanks to Gulf's excellent service, we always have a good supply of their products on hand to meet our requirements."

There's a double squeeze today on America's construction men—every job is marked rush, and new equipment and spare parts are hard to get. So these are the orders of the day on every construction project: *make equipment operate more efficiently, last longer!*

Here's how to get effective help in carrying out these orders on your jobs: Call in a Gulf Service Engineer and ask him to prescribe the proper type and grade of lubricants and fuels for each piece of equipment you are using. From Gulf's complete line, he will select lubricants that provide maximum protection to your equipment under every operating condition. And, he will recommend fuels that insure top-notch equipment performance. Write or phone your nearest Gulf office today.

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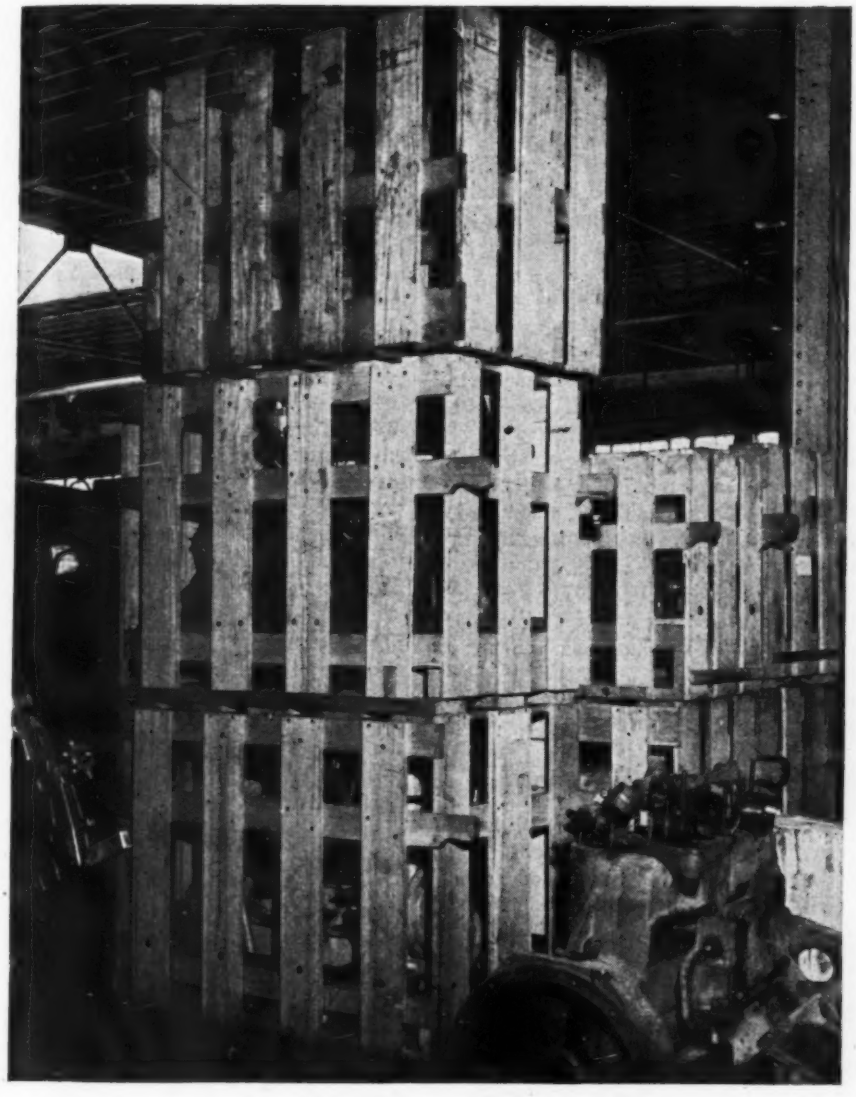
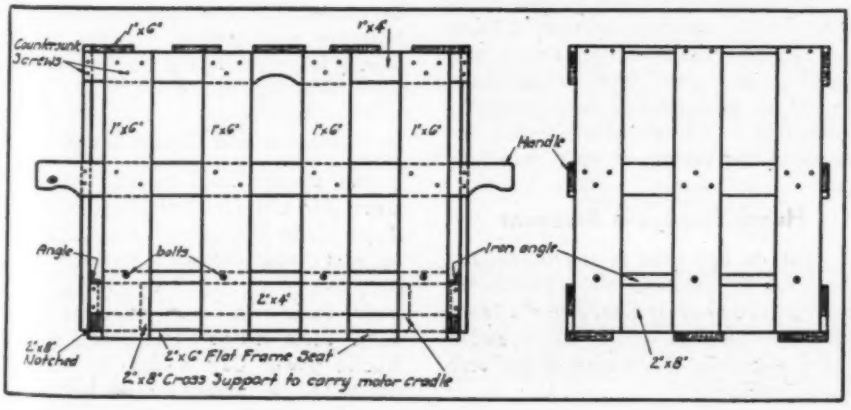
GULF BUILDING, PITTSBURGH, PA.

Equipment Maintenance

Modern Crates Protect Motors, Save Labor





WHILE the Minnesota highway department does most of its equipment repairs in sixteen scattered district shops, it has found it desirable to centralize a considerable volume of motor overhaul in the headquarters shop at St. Paul. Sometimes motors are brought in by truck, sometimes by rail. In both cases the loading, unloading and handling of motors used to be a troublesome and labor consuming job, and not infrequently engines were damaged in the process due to poor crating.

Today motors and other units move in and out of the shop with noticeable ease, thanks to a fine job of "crating engineering." Crates for various makes and sizes of motors have been designed and built to scientific principles. Every crate has four rounded handles for carrying when empty, located the proper height off the floor to facilitate lifting and give good balance. Crates are of sturdy oak construction, held together with screws instead of nails and equipped with angle-iron mounting brackets on which the motors are bolted. A typical crate design is shown in the accompanying figure.

Crates used in sending new motors into the field or to district shops are used whenever possible to bring in a motor for overhaul on the return trip. Each crate leaving the central shop with an overhauled motor bears a tag which gives the overhaul number, district office charge, etc.

Before the war crates were made of new select oak lumber, but of late serviceable crates have been made from salvaged lumber.

C. L. Motl is Minnesota state maintenance engineer.

(Upper left): Sturdy hardwood crates protect motors shipped in and out of the state highway shop at St. Paul, Minn.

(Left): Framing details for typical crate

Overhauling Navy Equipment for Overseas Duty

Eastern repair depot geared to handle 50 to 100 carloads of construction material per week

IN recent months as Navy construction work has eased off at home, huge quantities of Navy-owned construction machinery, tools, supplies and materials have been funneled through the nearest of three repair depots.

These plants are located in California, Oklahoma and Rhode Island. Their purpose is to recondition and reclassify equipment needed on advance base work by the Seabees. They handle not only tractors, scrapers, graders, shovels and such, but everything from decompression chambers and divers' suits to coat hangers and cotterpins. Excepting trucks and other automotive equipment, that is. Those go to the Navy's district transportation officers for disposal.

Something of the size of the Navy's job and the way the task is organized can be gained from the following "quick trip" through the depot at Lonsdale, Rhode Island. This depot, under the Bureau of Yards and Docks, is being operated under a cost-plus-fixed-fee contract. The plant occupies a group of old brick textile mill buildings and 35 acres of yard area.

Quick Organization

As we began an inspection tour the officer-in-charge, who by the way came out of the Mississippi state highway department, explained, "We've only been in full swing a few months. We came here in June and began business with a chair, a desk, a phone, several good key men from contractor outfits, and two carloads of parts. The first month an average of eighteen carloads of machinery and materials a day rolled in on us. In this early stage we rounded up and installed Navy-owned shop equipment, converted buildings, took on and broke in new workers and 'felt our way.'"

By August the machinery and materials were coming in a flood—98 cars of them the week of August 18. Up to the week of November 20, 853 carloads or 19,400 tons had been received, and over 2,100 major units were on hand that week including 112 tractors.

Three main shop divisions have been set up; one for small equipment, one for tractors and allied units, and one for shovels and cranes. The section called on to handle the greatest complexity of items is the small equipment section, housed in the basement of a 100 x 1,000-ft. 3-story mill building. All units and parts which will not overload the old floor are brought by elevator to the first and second floors above the basement. In this 4½-acre space the arrivals are received, checked, classified as to probable type of re-assignment and put in inventory.

Parts Handling

Parts go to groups of bins, there being a bin section for each make and model of machine, with bins in each section numbered serially. About 60 per cent of the parts required in overhauling are received from surplus or salvage stock from completed construction jobs. Remaining necessary parts are purchased through commercial channels.

Even with the Navy's high priority there is often a delay in securing certain parts, and one of the first things as each unit is inspected is to list the replacement needs and begin procurement.

Floor Space Marked Off

Most of the two big floors, however, is marked off into areas for the orderly storage of hundreds of items —light plants, carbide lights, pumps, tires, vibrators, table saws, jackhammers, wire rope, manila rope, tarpaulin, electrical cable, plumbing supplies, wheelbarrows, etc., etc.

Naturally the floor area is arranged for flexibility, as the inventory of any one unit changes constantly.

On the main floor are several shipping and crating centers, each equipped with table saws. Crates are built around each unit or shipping order; no attempt has been made to standardize or prefabricate crates because of the variety of units handled.

Heavy Storage in Basement

Next on our tour is the basement. An area of perhaps 100 x 200 ft. is used for storage of heavy parts from all departments—such as crawler sprockets, heavy compressors and spare engines.

This leaves more than an acre of space for the small-equipment shop rooms. These include a welding shop, where 8 to 10 welders are going full blast behind a partition; a small blacksmith shop with two forges (busy retempering small hand tools); a long line for overhauling small motors; a separate room for carburetor and electrical work.

Two men do nothing but overhaul light plants, two specialize exclusively in air tools, one or two each are on batteries and radiators. Otherwise there isn't much specialization; the men have to be able to tackle most everything. One metalizing unit has been installed.

Still farther on is the machine shop, where twenty or so lathes, milling machines, drill presses and other modern units have been assembled—all right from field shops on big Navy construction jobs that have been completed.

"Our problem here," said the officer-in-charge, "is to come within necessary tolerances for each task and still slam out a lot of work." One foreman, having had machine-tool training, for example, has a tendency to do a Rolls Royce job in installing new pins in a clam bucket.

In the basement of the "main" building also is a master tool room, used as a feeder for a small-tool room in each shop. A brass-check system is used in charging out small tools. "Leave your brass for tools" is the saying.

Four warehouse jeeps and 16 trailers of various sizes, plus hand push trucks, do the transporting in this big building. Some of the trailers were assembled from salvage parts. The building elevator is powered by a steam hoist converted to compressed air.

Tractor and Crane Shops

The tractor shop consists of a 3-story 100 x 60 ft. building with all floors above the ground floor knocked out and timber trusses installed to support the roof. Units are brought in under their own power or on a heavy-duty yard trailer (consisting of a Euclid power unit hooked up with a flat-bed). A mobile crane has done

the heavy lifting during overhauls pending installation of a shop-manufactured overhead crane. Eight units can be overhauled at once.

The crane shop is another 3-story-high room, 50 x 80 ft., arrayed with a long work bench along one side and space for four or five overhauls. Overhauling of excavators requires considerable space to "set the stuff," since here as in all other overhauling throughout the depot, *every* part is torn down and inspected. The Navy's G. I. overhaul is really 100 per cent. This policy is considered especially important for overseas shipments, for obvious reasons. For example, a crane which had run only 100 hours was completely torn down. Sure enough, several hidden parts had been worn seriously due to neglect of lubrication by a green operator.

A power and boiler house, a small building which houses a modern tractor track puller and bolt turning unit, a new steam cleaning room and a paint shop round out the scene.

Standard Parts for Overseas

Machines destined for overseas must have only standard, interchangeable parts. Use of metalized or welded parts and other salvage work is confined to units that will stay in this country.

"We get everything here," said my escort, pointing to a big consignment of tractor rollers. The funny "off brand" look that caught my eye was due to the fact that these rollers had been cast by some contractor worried over the parts shortage. Received rough-cast, these rollers were machined down, to be kept on hand for emergency.

All overhauled machines are run for a day or two to break them in. Graders and scrapers are given thorough test runs.

Cleanliness here is a watchword, kept alive in the interest of efficiency, accuracy and safety. All floor space is swept frequently and the mechanic who develops sloppy housekeeping habits is quickly noticeable. Tools can't "lie around" and disassembled parts are required to be stacked or clustered in the absence of bins.

(*Continued from page* 78)

Comprising only about 1% of the nation's road mileage, nevertheless the existing roads conforming nearest to the proposed system in 1941 carried 17% of all rural motor traffic. And created nearly all the congestion! No wonder the Post prophesies that 30,000 miles of new expressways will transform our entire 3,000,000 mile system. In Boyden Sparkes' words, "something that is certain to pay off handsomely for generations . . . something which will start us rebuilding our nation."

"Where do I come in?" each of us asks as we study this plan.

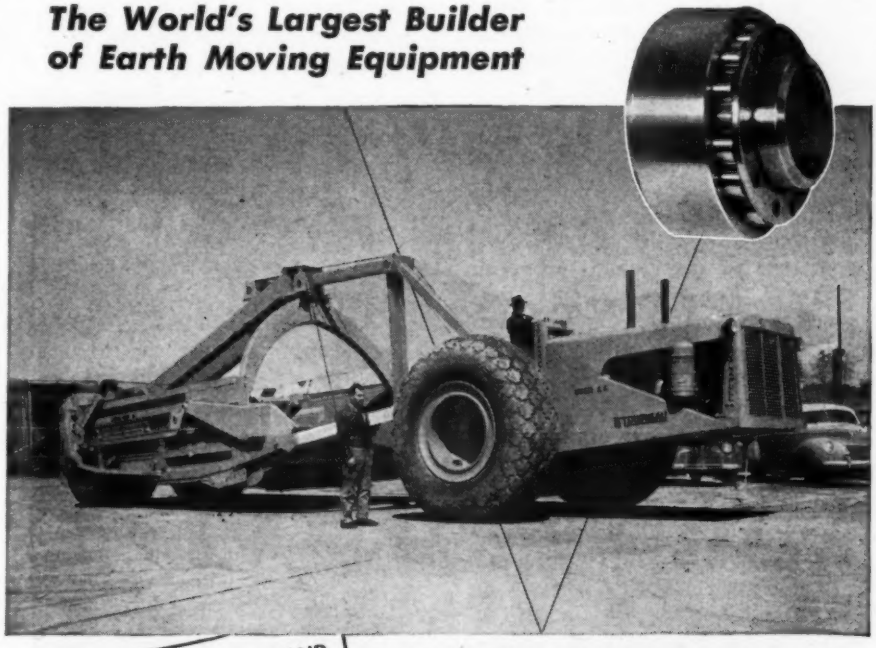
Will local and state road work take a back seat? Not at all. Healing the nation's traffic sore spots by a priority inter-regional program will accelerate overall auto and truck use, stimulate all road work, leave cities free to continue local and arterial street development.

Cities and towns off this system? None are completely "off." It would skirt near a remarkable percentage of places, reach *part way* toward every hamlet.

In transmitting it to the President, General Fleming wisely reminded that there is imperative need for "large expenditures to repair the deterioration now in progress and eliminate critical deficiencies on other roads of national importance . . ." and not limit Federal assistance to an inter-regional system.

The big value of this report is that it spotlights the particularly urgent municipal part of the post-war road job.

The World's Largest Builder of Earth Moving Equipment



SOMEWHERE IN ENGLAND Earthmovers, Ltd., one of the largest earth moving syndicates in England uses 3 LeTourneau Model C Tournapulls and a fleet of Carryalls to handle 500,000 cu. yds. of earthmoving on an aerodrome project "somewhere in England".

LETOURNEAU USES RBC ROLLER BEARINGS

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Call them road building behemoths, mechanical mammoths or what you will, these LeTourneau Tournapulls (the largest is Model A6 above) are finely balanced pieces of machinery that depend on precision-made RBC Roller Bearings for frictionless operation of the reverse gear and case group. They are also used almost exclusively in sheave applications on their Carryall Scrapers, Bulldozers, Angledozers, Pushdozers, Cranes and Rooters.

ROLLER BEARING COMPANY of AMERICA
TRENTON . . . NEW JERSEY

Power Mower Maintenance and Repair

By LeROY BROWN
Property and Equipment Engineer, Iowa State Highway Commission, Ames, Ia.

THE Iowa State Highway Commission owns 258 tractor-type highway mowers scattered over 99 counties and operated on approximately 9,200 miles of primary roads. The practices and experiences of the Iowa State Highway Commission as related to this article are by no means an exact standard to follow, for policies and practices vary in all departments operating power highway mowers.

However, in the operation of any type of equipment, certain cardinal principles should be observed. Since this paper deals with power mowers, we will confine ourselves to this seasonal equipment and consider the two phases of their operation and repair:

1. Maintenance care and repair during the operating season.
2. General overhaul and repair during the off season.

In considering the first phase, proper care of the units is of great importance. For successful operation, preventive maintenance is in order *at all times*. It is essential that the operator assigned to the unit be thoroughly familiar with it. His knowledge of the power unit and its possibilities must be complete.

Fundamental Rules of Care

The mower attachment, while simple in construction, can only operate efficiently if certain fundamental rules are followed. Alignment of guards, proper knife register, good sections and correct lead are rules the operator should observe to get 100% performance.

He should familiarize himself with the road sections to which he is assigned so that he can avoid striking obstructions and dropping into gullies and ditches. Both accidents are responsible for serious damages to the power mower.

Correct operating practices and knowledge of the machine will prevent major breakdowns and lessen delays during the operating season. Cutting bar parts, guards and sections will of necessity have to be replaced during the mowing season.

The second phase in the operation of this type of equipment is the general overhaul and repair during the off-season.

Check at Season End

Due to the difficulty experienced in securing replacement parts, we have advocated checking over this type of equipment immediately after the mowing season and placing orders for repair parts that will be required.

The Iowa Highway Commission operates a major repair shop and central stores at Ames. In addition, repair work is handled by field mechanics in the majority of garages in the 99 counties.

When mowers are ready for general overhaul, they are inspected by traveling mechanics, four of whom operate in the state under instructions from the central office. This inspection is made in conjunction with the field mechanics and a decision as to needed repairs is made.

Generally speaking, the majority of the overhaul is taken care of in the local shops, with the exception of motors and transmissions that need considerable work. The local shop does not have the facilities or the mechanics the time for this work.

Such units are sent to the central shop at Ames whenever feasible. All old parts on the mower attachment are reconditioned by welding, brushing, etc. Care is exercised to keep all repairs standard so that any replacements during the operating season will fit.

When parts require rebuilding and the local shop cannot handle it, replacement parts are furnished from Ames and the old parts are returned to the major shop, reconditioned and put into stock for use on some other unit.

The various steps in repair necessarily vary with the condition of the unit at the close of the operating season. The type of repair is governed by the condition of the parts and the ingenuity of the mechanics.

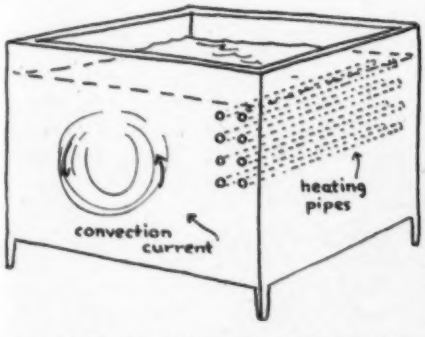
Scene in the central shop of the Wayne County (Mich.) highway commission where a full-time lawn mower repair specialist keeps busy in huge winter overhauling of the county's big fleet

Welding Truck Frame

When welding a break in a truck frame channel, reminds "The P. & H. Weld," patch plates the full depth of the channel sides should be welded across the break. But only the top and bottom edges should be welded. Be sure to leave the ends unwelded; it makes a stronger job.

Agitator Tank Helps Remove Motor Varnish

A problem in every road equipment repair shop is that of cleaning old engines of heavy accumulations of "varnish" or lubricating-oil deposits. At the Minnesota state highway headquarters shop at St. Paul, superintendent Dwight Hayden and his boys tried out many different cleaning compounds, none satisfactory, until they finally found heated Oakite paint stripper to be effective.



To help do a thorough cleaning job, a special agitator tank was designed with the aid of an engineer from the local gas company. This tank holds 250 gallons or 5 barrels of water-Oakite mixture and is large enough to accommodate a fairly large engine casting or part. A gas burner heats water which circulates through tubes inside the tank and arranged along one side. The presence of the heated pipes or coils causes a gentle circular convection current in the tankful of hot cleaning solution. The procedure is to set the part to be cleaned into the tank, and fill tank just above the coils, turn on the heat and let the part "cook" for 20 to 30 minutes.

A transfer pump empties the solution to another tank for storage when not in use or when the treatment tank needs cleaning. This tank has given good service for five or six years.

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Rebuilding Tractor Grouser Cleats

A short economical method of repairing worn tractor grouser cleats, using special shape manganese nickel steel applicator (filler) bars to save welding time

By J. CURTIS FORD
Welding Engineer, Stulz-Sickles Co., Newark, N. J.

BECAUSE of the continued shortage of replacement parts, the importance of salvaging old and worn equipment can not be overemphasized. Many tractor owners who formerly bought new tractor shoes are now rebuilding worn-down grousers and are well satisfied with the results. Worn grousers on tractor shoes causes the tractor to slip and slide, thereby causing loss of traction which results in increased cost of operation.

The tractor shoe is usually high-carbon or special-alloy steel and can easily be repaired by electric welding. There are several methods of rebuilding these grousers, one of which will be described in this article. The old method was to deposit one layer of weld metal on another until the grouser was rebuilt to its original size. However, this proved so slow and expensive that an applicator bar was developed to take the place of a greater part of the weld metal, thus reducing the cost and also making a much neater job.

Five special wedge-shaped manganese-nickel steel applicator bars are made expressly for this purpose. They conform to the original shape of the grouser, being thicker at the base and tapering at the top as shown in the

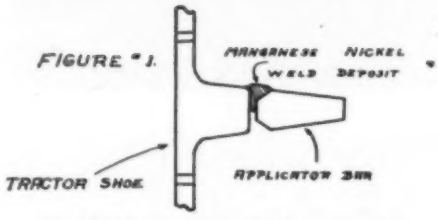
No. 100 No. 150 No. 200 No. 250 No. 300

cross sections as listed below:

Section	Top	Bottom	Height	Est. Wt. Lbs. Per Ft.
No. 100.....	1/8"	3/8"	7/8"	.96
No. 150.....	1/4"	9/16"	15/16"	1.29
No. 200.....	5/16"	5/8"	1-5/16"	2.02
No. 250.....	5/16"	5/8"	1-3/4"	2.79
No. 300.....	7/16"	3/4"	1-7/16"	2.63

These special-shaped cars are produced in five sizes to fit different sized grouser shoes, and inasmuch as these applicator bars are manganese-nickel steel they will work-harden under impact and abrasion to 500 to 550 brinell, thereby giving much longer wear than the original cleat on the tractor shoe. A lot depends on the amount that has been worn off of the grouser, as well as the size of the tractor, as to the size bar to be used. These bars run in mill lengths of 16 to 20 ft. and have to be flame-cut to the width of the shoe, which ranges from 12 to 24 in.

FIGURE "1.



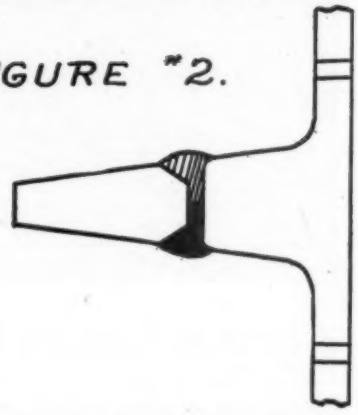
If the pins and bushings of the shoes do not need replacing, there is no need to take the shoes off the tractor to repair them, since the bar can easily be welded on as the shoes come into position. It is first welded on one side as it comes up the back of the tractor (Fig. 1). The other side is welded as the shoe comes down the front of the tractor (Fig. 2). This allows a flat welding position which gives the best results when welding with manganese-nickel-steel electrodes.

The first thing to do is to determine the size of the bar needed. This can be done by determining the amount of the original grouser that has been worn off. For instance, say about 1¼ in. of the grouser is worn down, and the thickness of the worn grouser at this stage is ¾ in. Then the size of bar needed would be 1¼ in. in height with the ⅝-in. base and tapering to 5/16 in. at the top of the bar. This would put the grouser back to its original height.

Best Rod Type

The best type of electrode used for this purpose, is a bare or coated manganese-nickel-steel electrode which has a very high tensile strength, and since the success of the job depends

FIGURE "2.



entirely on the ability of the weld deposit to hold the bar on the shoe, it is most important to use the best material available.

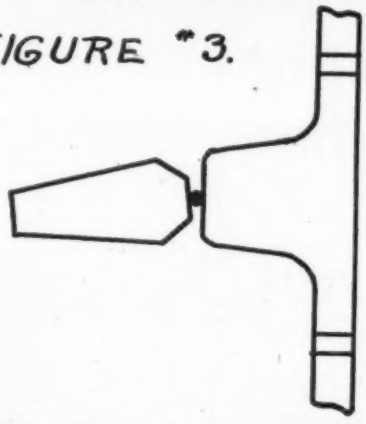
The worn down grouser need not be prepared in any way, other than seeing that the parent metal is clean from rust and dirt. Even though the grouser has worn off more on the ends, it is not necessary to square it off with a torch; this merely increases the cost of the job.

Attaching the Bar

When attaching the bar, see that it is tack-welded at both ends and in the middle, at about ⅛ in. off the parent metal. This allows good penetration of the weld metal. Also, do not tack it on straight but at a slight angle to allow for the weld deposit to pull the bar straight as it contracts (Fig. 3). Only one heavy bead of welding on each side is necessary to hold the bar on, although some welders prefer to have two beads on each side for added safety.

It is most important to weld a short, heavy deposit, puddling it by weaving the electrode in a half-circular movement. Never weld more than one-half of an electrode at a time, and peen immediately after it has been deposited, while still hot.

FIGURE "3.



This relieves the stress brought about by the contraction of the weld metal as it cools. The heavy weld deposit gives the maximum strength and keeps it from cracking, which will sometimes happen on a long thin welding bead, when welding with manganese-nickel steel electrodes.

After the bar has been welded on, the ends should be tapered toward the center, at an angle of about 30 degrees with the vertical.

The welding time required to rebuild the grouser cleats of a Caterpillar RD-7 tractor, is about 20 hours. The amount of welding rod needed for this sized tractor is approximately 70 pounds, equivalent to about one pound per shoe. Grousers rebuilt in this manner will last at least twice as long as new grousers. Much valuable time is saved by not having to wait for new parts and the repair cost is only one half to two thirds the cost of new shoes. By keeping the grousers rebuilt to their original size and shape much strain and wear is saved on all of the tractor parts.

Compressor Data on Mountain Road Jobs

The part that compressed-air tools and portable air-compressors play in mountain trail building today is shown by the following figures from the Compressed Air Institute, terminal tower, Cleveland.

1. Cutting away of 25,000 cu. yd. of solid rock on a mountain trail. The terrain was extremely rough and much of the drilling for purposes of blasting had to be done with the drillers tied to trees along the mountain side. To drill all the holes needed for blasting, slightly over 3,000 hours of compressor operation was needed. Something over 50,000 ft. of drilling was accomplished during this time, with modern air-operated rock drills weighing less than 50 pounds.

The portable compressor used creating up to 100 lb. pressure, consumed about $850 in gasoline, and $125 in oil. Labor was about $5,000. Including all costs—repairs, fuel, labor as well as incidentals and equipment depreciation—the drilling was done at about 12 cents a foot.

2. Another road job involving 40,000 cu. yd. of solid rock. One of the cuts was 65 ft. high at the peak and 250 ft. long; total of 4,229 cu. yd. of gneiss. Drilling and blasting completed in 26 days, using two portable compressors of 210 cu. ft. capacity with four rock drills. The down holes on this job averaged 12 feet deep, while the horizontal holes averaged 10 feet. 4680 feet of hole was drilled.

Lubricating Dipper Handle, Racking and Pinions

"Timely Tips for the Dragline, Shovel and Crane Operator," published by Lima Locomotive Works, Lima, Ohio, reminds the dipper handle is exposed to all kinds of weather and dust and dirt; therefore it should be given special attention. Always keep dipper handle, racking and pinions well coated with gear compound or heavy black oil, depending upon working conditions. When machine is working in a sandy location, use a heavy black oil. Sand will not stick to a handle coated with heavy oil as readily as when coated with gear compound. If gear compound is used, heat it and apply with a brush for best results.

This nice job armoring this bucket to reduce wear was done by welders in the California division of highways' shop at Sacramento

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CONTRACTORS' PUMPS, MIXERS, HOISTS, PAVING EQUIPMENT

Tractor-Shovel Maintenance

VALUABLE suggestions on the care and maintenance of front-end shovels are given by P. H. Lash, chief demonstrator for The Frark G. Hough Co., Libertyville, Ill. The following excerpts are of wide interest to users of construction equipment:

Checking New Machine. The endurance and service of a front-end shovel depend largely on its start in life. In our experience, most frequent trouble source is *failure to prepare machine properly before it is put to work.*

Too many operators think brand new equipment is all "ready to go." Adjustments are often necessary, and if these are neglected, the operator may have grief later on. Upon receiving a new machine, check it throughout. Check cables to make sure the bucket is raising evenly, and that cable clamps are tight. Check the oil level in the reservoir, see that you have a good grade of SAE-10 oil in the hydraulic system.

Lubrication. Thoroughly lubricate the machine, making sure that the pump shaft bearing and all of the sheaves are greased. Oil the camshafts and cams that release the bucket latches and coat the guide-frame sides, wear strips in front of the guide frame and the booms where they enter the side tube with a good grade of grease for external use such as used on the sticks of dipper-stick shovels.

It would be well to follow the standardization of oils, greases and oiling periods developed by the Corps of Engineers for war fronts. Variety of lubricants must be limited, so list has been cut to ten—three general-purpose greases, three engine oils (SAE 10-30-50), an oil for the lubrication of chain, wire rope, etc., a wheel-bearing grease, and two universal gear lubricants, SAE 90-80. Oils and greases of this type are easier to obtain today than less demanded types.

Hard-facing bucket edges increases life

Greasing Period. The army engineers' greasing period is 8 hours instead of one day because the equipment in wartime operations may work for 24 hours or more at a stretch. Consequently, the crew finishing an 8-hour shift lubricates all points indicated for "once-a-day lubrication." At conclusion of second 8-hour shift the crew going off duty lubricates all "once-a-day" points, and any "two-day" points that may be shown. This is carried out through multiples of eight to the equivalent of the period when the equipment should receive a general overhaul. In civilian applications, when operating over 8 hours per day, it is well to adapt the army's system.

Tightening Up. Check all the cap-screws, bolts and nuts on the entire unit. Be sure they are all tight and none have been lost in transit.

Hydraulic System. On high quality hydraulic systems pump and valve are built with close tolerances. They require better care than your automobile. The oil should be drained every 300 working hours and entire system flushed with kerosene. Do not use a heavier oil at any time than specified.

Avoiding Oil Pump Trouble. Whenever you get a noisy pump, there are two things wrong. Intake oil line to pump is plugged, sometimes caused by the intake hose collapsing, but in most cases, traced to pieces of paper, old rags or sludge in the system, or proper oil level in the reservoir has not been maintained. Check level daily.

Hoisting Cables. Watch cables constantly for wear and keep them adjusted so that the bucket is level when raised. It is good practice to replace the cable as soon as you notice that the fine strands are beginning to break, otherwise the worn cable will break when you are transporting or lifting a load, causing possible damage to other parts.

Job Layout. There is a proper way to lay out the job for tractor shovels, especially the crawler type. It is a poor practice to push or crowd anything while shovel is 3 ft. above ground. If working against a high bank, as in a gravel pit, materials should be loosened with explosives to keep it running down to the grade. If you have a high bank to take down, and room available, the best place to start is on the top. Take it down in 6 to 12 in. levels over entire area.

Don't Scrap it - WELD IT

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For speedy, wartime emergency repair welding, you can't beat MANGANAL WELDING PRODUCTS. With MANGANAL you can meet every requirement for efficient, fast, durable repair welding.

Repair your broken and worn parts with Manganal—it's the easy, quick and efficient way. Manganal alloy steel welding, wedge bars and shapes give new lives to old parts.

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NEWARK, N.J.

Developments on Post-War Front

Twenty-one proposed post-war construction projects calling for $27,000,000 expenditure have been submitted to the PRA by the Ohio Division of Highways. To be financed on a 50-50 federal-state basis, these projects represent about a seventh of the program which the state is in a position to finance on this basis. About 135 miles of road is involved, mostly on the strategic network. Plans include relocation to speed up traffic, with by-passes around congested business sections of some communities, replacement of obsolete bridges, and salvage or reconstruction of worn-out surfaces.

* * *

Expenditure of $12,500,000 over a five-year period is contemplated by Kent County (Grand Rapids), Mich., under a post-war plan being pushed vigorously by Otto H. Hess, engineer-manager of the county road commission. With a "Blue Prints Now" slogan, it is believed to be one of the first counties to take definite post-war planning steps. Road improvements involved total 580 miles, or a third of all county roads, including about half the present black-top mileage. Some 60 miles of hard-surfacing is to be widened. Over 185 new bridges and 8 grade separations are included, with 42 bridges to be remodeled. Engineering plans to be 15 per cent done by end of 1944, 50 per cent by end of 1945. This county recently has spent only about $400,000 annually on new construction.

* * *

A project for construction of a 4-lane divided highway between Annapolis and Washington, D. C., has been presented to the Maryland Commission on Post-War Construction and Development. The first section will by-pass the center of Annapolis.

* * *

A $44,055,000 post-war bridge and viaduct program for Chicago has been formulated by Stephen Michuda, city bridge engineer. Nine projects totaling $15,155,000 have been authorized by the city council and money allotted from the motor fuel tax for their completion. With plans ready for starting work within 30 days, these structures include bridges at State street near the "loop" and other spans over the Chicago river as well as street grade crossing eliminations.

* * *

Massachusetts is planning to build or rebuild about 450 miles of highways after the war, along with 150 bridges. Because of the metropolitan nature of these many projects, costs will run $50,000 to $350,000 per mile, according to commissioner Herman A. MacDonald at a recent post-war conference. The Boston Arterial Artery will cost $5,000,000 a mile. Bridges will cost from $10,000 to $1,500,000 each, bringing the total post-war estimate to $150,000,000.

* * *

New Jersey cities are contemplating post-war work that will cost more than 105 million dollars, according to Walter R. Darby, commissioner of municipal accounts. Mr. Darby recently questionnaired N. J. towns and cities which among other facts report that about 60 per cent post-war work would be financed by municipalities upon their own credit.

* * *

A tentative program of $208,000,00 for construction work covering a 6-year period following the war has been formulated by the State Highway Department of Louisiana. During 1944 it is expected to spend $433,280 as follows in preparing for this program: Advance engineering, $100,000; investigations, $133,280; surveys, plans and estimates, $200,000.

California Post-War Projects

Among the major advance engineering projects approved by PRA in California are: Four projects involving completion of Bayshore Freeway from the San Francisco-Oakland Bay Bridge on the west side of San Francisco Bay via San Mateo, Redwood City, Moffett Field and San Jose to connect with present route southeast of San Jose. Plans for nine miles of this route are already completed by the state and the new work covers 42 miles.

A new limited access highway from a point on High Street in Oakland along the east shore of San Francisco Bay to connect with the proposed Bayshore Freeway north of San Jose. This new route, 33 miles long, will be known as the Eastshore Freeway and will bypass congested urban and industrial areas.

Four projects for development of a freeway from near Universal City through the business section of Los Angeles southeasterly to Irvine. Length 45.5 miles.

Three projects for a freeway from the east end of Oakland-San Francisco Bay Bridge through Oakland and Richmond to Carquinez Bridge. Length 18.6 miles.

The Job Ahead

By ROBERT MOSES

Park Commissioner of the City of New York

(*From the New York Herald-Tribune*)

Every city needs public repairs and improvements. The time to do the work is right after the war when it will contribute to the relief of unemployment. And the time to plan is now.

To get this job done, we must dismiss the protests of two types of extremists: the starry-eyed planners who insist upon revolutionary changes, and the stick-in-the-mud standpatters who want to do nothing.

The starry-eyed planners, academic economists and bird-bath architects are the ones who talk of moving our cities into the suburbs, or planning entirely new communities starting from scratch. That is utter nonsense. Cities die of dry rot and anemia, but they don't commit suicide.

The standpatters claim they can employ everybody after the war without government help, if government will only give them a free hand. With the reactionaries are certain civil-service forces who don't like to have their routine disturbed or their snail's pace accelerated in order to speed up postwar plans.

Of course public works are no substitute for private business. We are more than ever dependent upon our industrialists and contractors to retool and expand when war production ends. But this will take time, and we must not depend on them too much.

Peace cannot immediately usher in an age of new production on such a vast scale that everyone will be employed automatically. It would be a pity if private industry's splendid war record were spoiled by overconfidence. Only the fullest cooperation of the government, industry and labor can tide us over the critical period of demobilization.

There is another obstacle in our path—the opposition of domestic isolationists who insist that states and municipalities roll their own in financing postwar public works. It can't be done because they simply can't afford it. The task is to get federal aid without federal bureaucratic control.

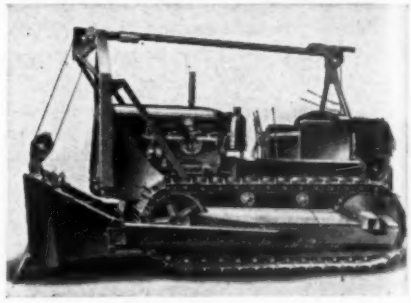
Unless we grasp these facts in time, we shall head straight into another wasteful and disillusioning relief program.

New Equipment and Materials

LaPlant-Choate's New Dozer

Outstanding among the new earthmoving equipment units being introduced by LaPlant-Choate Manufacturing Co., Inc., of Cedar Rapids, Ia., as a part of its post-war program, is the "Adjustadozer." This is a new type of dozer designed so its blade may be tilted in four positions—16 in. up or down at either end of blade and 3¼ in. forward or backward at top and bottom. In addition it can be held in straight bulldozing position. The blade can also be raised 45 in. above the ground line and dropped 6 ft. below ground level. In raising a powerful lift is developed. Cable operated.

The backward and forward tilting of the blade is a special feature of this machine. The blade is adjusted through a simple screw jack mechanism operated by a rachet lever. The



adjusting mechanism is equipped with regulating gauges which indicate blade position—an exclusive feature. They simplify and remove guesswork in adjusting blade, and make it possible for one person to completely adjust one side of the machine before going to the other side to make a final adjustment.

Various blade positions enable the "Adjustadozer" to perform a wide variety of earthmoving jobs—opening shallow "V" ditches and doing hillside work; working in different kinds of material; leveling. Tilting the top forward, for example, enables the machine to do a better job of leveling as the cutting edge will not dig in but is pushed over the loose earth. When the top is tilted backward, the cutting edge will penetrate very hard material and presents a sharp edge to any obstruction. The unit is designed for mounting on Caterpillar D-7 tractor.

▼

High-Speed Military Tractor By Allis-Chalmers

How Uncle Sam's big guns will get to Berlin was revealed with announcement of a radically new type high-speed artillery tractor developed by the Tractor Division of Allis-Chalmers Manufacturing Company in

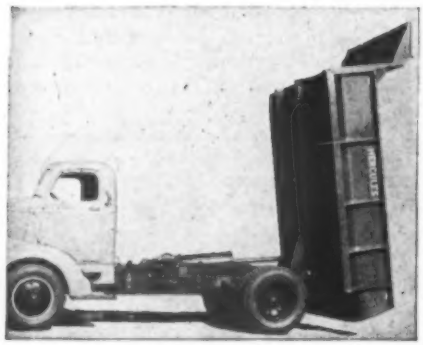
cooperation with U. S. Army Ordnance.

An 18-ton tank-type tractor, officially an M-4 Prime Mover, the new unit besides hauling heavy artillery carries the gun crew, initial ammunition and a caliber .50 machine gun.

A closely guarded military secret until now, this tractor has already seen front-line action.

It incorporates the latest automotive engineering developments as well as innovations in design and operation.

BODIES and HOISTS LIKE THESE by HERCULES...



Hercules High Dumper
Power up, Power down

are giving maximum service with minimum expense, day after day, on the home front.

"Victory is our business", and our war production is playing an important part in bringing victory nearer; but production for essential civilian use is also important, and we're able to make quick deliveries on many types of Hercules Hydraulic Hoists and Bodies to you.

See your Hercules Distributor, or send inquiries direct to us.

Hercules Low-mount Sanitary Body

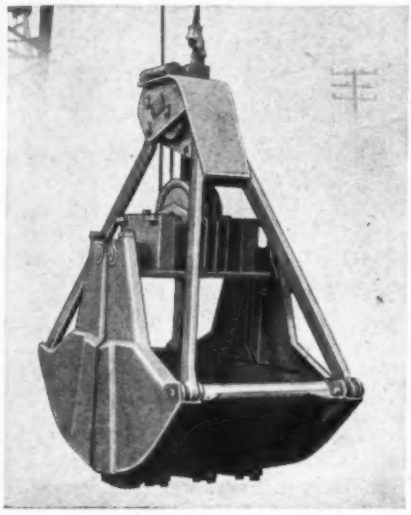
HERCULES STEEL PRODUCTS CO.
GALION, OHIO

Hercules Braced Side Rub Rail Body

Hercules 6-Batch Coal Body

New Clam Bucket

After extensive field tests, The C. S. Johnson Company of Champaign, Illinois, have announced a new all-welded clamshell bucket. It includes a renewable manganese steel lip to provide long wear. Closing sheaves are equipped with needle bearings, protected against dirt and moisture by a special synthetic rubber seal. To prolong rope life, sheaves are of large diameter and guide sheaves have been substituted for guide rollers. Subject to required government authorization, general-purpose and also rehandling buckets are immediately available in sizes ½ to 2½ yd., heavy digging buckets to 1½ yd.



New Fire or Crash Truck

The Army crash truck shown in the accompanying illustration, which is an example of the conversion of peace-time equipment to war use, is now being built by several manufacturers of trucks and fire equipment. It is used at airfields to smother in record time the flames resulting from crash landings of aircraft and utilizes the latest developments in hydraulics.

Army Crash Truck in Operation

In actual use, the pump on this truck delivers water from its 1,000 gal. tank at the rate of 300 gal. per minute and at three times the pressure of ordinary fire engines. Such terrific pressure produces a dense fog

An Important Message to

Technical Men

The war has carried the manufacturing age to a new peak! Production demands have created technical problems the like of which the world has never seen before! The services of engineers are at a premium. Especially the services of one particular class—executive engineers—*engineers with business training;* engineers who can "run the show."

In these critical times, the nation needs engineers of executive ability *now, today*—not five, or ten years from now! The shortage of such men is acute—even more acute than that of skilled production workers. And company heads, aware of this situation, are offering high rewards to engineers who have the necessary training in industrial management.

Golden Opportunity for Engineers

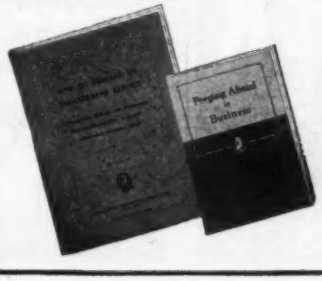
In this new era, the engineer with vision and foresight has a golden opportunity. He will realize that out of today's tremendous production battles will emerge technical men who not only will play a major role in winning the war, but who also will be firmly entrenched in key executive positions when peace comes.

However, before the engineer can take over executive responsibilities, he must acquire knowledge of the other divisions of business—of marketing, accounting and finance. He has of necessity a vast amount of technical training and experience. But in order to grasp the opportunities that present themselves today—to assume leadership on the production front—he must *also* have an understanding of practical business principles and methods.

The Alexander Hamilton Institute's intensive executive training can give you this essential business training to supplement your technical skill.

FREE help for engineers

Ever since the war began, there has been an unusually heavy demand on the part of our technically-trained subscribers for the Institute's special guide on "How to Prepare an Engineering Report". Extra copies of this practical, helpful 72-page Guide are now available and, for a limited time only, will be sent free to all technical men who use the coupon at the right.



134,000 men on the operating side of business have enrolled for this training. More than 37,500 are technical men—engineers, chemists, metallurgists—many of whom are today heads of our huge war industries.

This training appeals to engineers because it gives them access to the thinking and experience of the country's great business minds. It is especially valuable to such men because it is basic, not specialized—broad in scope, providing a thorough groundwork in the fundamentals underlying *all* business. It covers the principles that every top executive must understand. It applies to all types of industrial organizations, because all types of organizations are based on these same fundamentals.

Business and Industrial Leaders Contribute

The Institute's training plan has the endorsement of leading industrialists and business men. And it is only because these high-ranking executives recognize its value and give their cooperation that such a plan is possible. Among those who contribute to the Course are such men as Frederick W. Pickard, Vice President and Director, E. I. DuPont de Nemours & Co.; Thomas J. Watson, President, International Business Machines Corp.; James D. Mooney, President, General Motors Overseas Corp.; Clifton Slusser, Vice President, Goodyear Tire and Rubber Co. and Colby M. Chester, Chairman of the Board, General Foods Corp.

Send for "FORGING AHEAD IN BUSINESS"

The facts about the Institute's plan and what it can do for you are printed in the 64-page book, "Forging Ahead in Business". This book in its own right is well worth your reading. It might almost be called a handbook of business training. It is a book you will be glad to have in your library, and it will be sent to you without cost. Simply fill in and mail the attached coupon *today.*

Alexander Hamilton Institute
Dept. 92, 73 West 23rd Street, New York, N. Y.
In Canada, 54 Wellington St., West, Toronto, Ont.

Please mail me a copy of the 64-page book—"FORGING AHEAD IN BUSINESS" and also a copy of "HOW TO PREPARE AN ENGINEERING REPORT," both without cost.

Name.....

Business Address.....

.....

Position.....

Home Address.....

which, when distributed through the turret guns, simply blasts away the flames and smoke.

By installing the Hercules split-shaft power takeoff in the drive shaft of this crash truck, Army Engineers found that the full power of the truck motor could readily be transmitted to the pumps, thus eliminating the need for a special motor, and much space and weight were saved.

▼

AMSCO "Missing Link" for Dragline Chain

Issuance of U. S. Patent (2,287,293) to John O'Fallon Clark for a dragline chain repair link records a contribution to the performance of dragline bucket chain, according to engineers of American Manganese Steel Division, American Brake Shoe Co. Clark

originally introduced manganese steel bucket chain; which though very durable of course breaks occasionally under excessive stress.

Closing or repair links ("missing links"), have been in use for years; but the Clark replacement links enable quick field repairs and insure a tightly held joint. For larger chain, (1¼" to 2½" section) having the longer pitch lengths, the "Clark" link (M-91), is recommended. The halves, with interlocking lugs, are secured by four rivets to produce a tight joint.

For smaller chain (⅞" to 1⅛"), the "J-C Link" (R-890) is more adaptable. In it, tapered ends fit closely into grooves in the opposing half link, and the two halves are joined together by a single rivet through the joined center lugs. The center bar or stud prevents the kinking that might lead to destructive jerks in operating.

▼

Simplex Hydraulic Jacks

Templeton, Kenly & Co., Chicago, has added tandem-pump, Simplex 30

Model 30HJ—capacity 30 tons; low height 11"; hydraulic lift 7"; weight 65 pounds

and 50-ton hydraulic jacks to its line. Up to this time, a 20-ton capacity was the largest hydraulic jack made by this company. Recommended where cranes are not available, these hydraulics have high and low speed pumps, operated singly or in unison.

The base is made of special-analysis solid steel bar stock.

GRUENDLER CRAFTSMANSHIP
Employed by U.S.A. in the WAR EFFORT

For Access Road and Air Base Construction

PORTABLE CRUSHERS

Proper Size Aggregates-on the Job

Balanced, Non-Tipping. Expertly designed to meet your exact requirements in proper size aggregates—larger capacity and quick mobility to and from job.

Four Wheel Maintenance JAW CRUSHER with Power Unit

GRUENDLER ENGINEERS

On the job to help you in any way, NOW and for your Post War Plans. Blue Prints or Practical Suggestions sent —No obligation.

Write for . . . Bulletins and Illustrated Catalog No. 601

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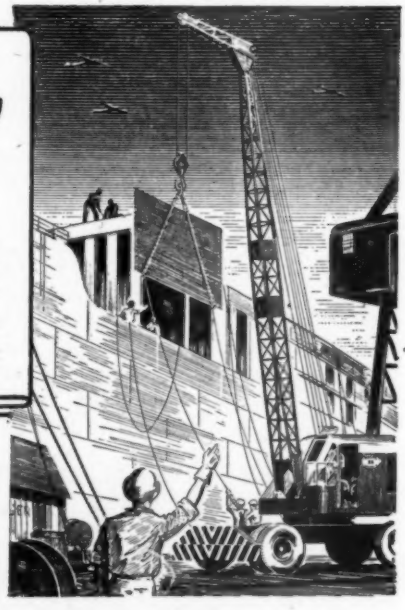
GRUENDLER CRUSHER & PULVERIZER CO.
PLANT and MAIN OFFICE—2915-17 N. MARKET • ST. LOUIS, MO.

Until the enemy cries "E-nuff"

THE BYERS CRANE YOU'D LIKE TO HAVE IS HANDLING SUPPLIES AND MATERIALS IN AMERICA'S SHIPYARDS



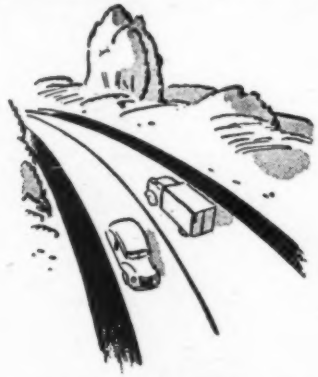
In the meantime, owners of current and older models of Byers shovels and cranes may depend on Byers Parts Service to help them keep present equipment working steadily and satisfactorily.

WHEN THE WAR IS WON

Byers will offer you new, improved, faster mobile cranes and shovels for peacetime jobs.

BYERS CRANES AND SHOVELS
RAVENNA, OHIO
DISTRIBUTORS THROUGHOUT THE WORLD

ASPHALT
for
HIGHWAY WIDENING AND MAINTENANCE



As an emergency measure, highway widening can provide adequate capacity for handling traffic flow increased by defense activity. This saves the delay and expense of constructing new roads which may or may not be required in normal times.

Asphalt construction offers the fastest and simplest method of getting results. Not only can it use local aggregates, but Asphalt can be laid with little interference to traffic.

Wherever Standard Oil Asphalt products are sold, there is an Asphalt representative who can give you full information about these and other uses of Asphalt. Write . . .

STANDARD OIL COMPANY (Indiana)
910 SOUTH MICHIGAN AVENUE, CHICAGO

Norgahnize Your Snow Plows for the Battle Ahead!

NORGAHN
SNOW PLOW SPECIALTIES

are designed to increase snow plow efficiency. For best results use all three.

- **MOLDBOARD GLAZE**
  Tested and used by Corps of Engineers to (1) reduce friction of snow to moldboard; (2) prevent snow from sticking to moldboard; (3) protect plowing surface during idle periods.
- **WINGSLIDE COMPOUND**
  For upright wingslides. Provides lubrication which does not mix with snow or water to form "sludge."
- **HYDRAULIC FLUID**
  Special low-cold test fluid designed to withstand high pressures found in snow plow hydraulic systems.

Write for Complete Data

NORGAHN COMPANY
WAUSAU, WISCONSIN
Snow Plow Specialties

A booster hoist under *ANY TYPE OF BODY* spells ***SAVINGS***

IT'S QUICKER, EASIER, CHEAPER TO DUMP IT

with the ST.PAUL BOOSTER HOIST

What kind of load can the St.Paul Booster Hoist *dump* for you... scrap iron? Castings? Logs? Lumber? Many loads formerly unloaded by slow handwork methods are now *dumped* by the St.Paul Booster Hoist. Saves time! Saves money! *Your platform or stake body can be converted.*

Please write us giving particulars of the essential work you'd like to use our Booster Hoist for and the equipment now being used.

BUY AN EXTRA BOND!

ST.PAUL HYDRAULIC HOIST COMPANY
2207 University Avenue, S. E.
MINNEAPOLIS 14 MINNESOTA

Sullivan's New Products

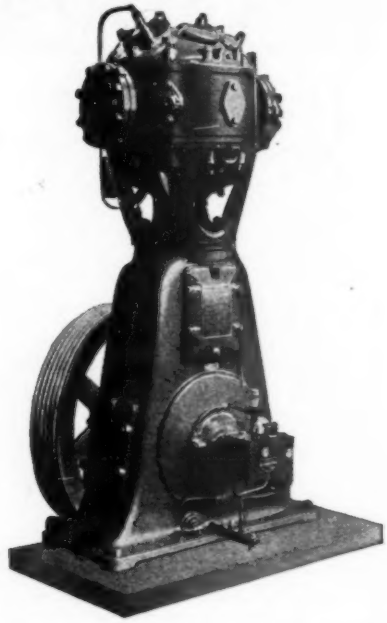
45-lb. Drill—The Sullivan L-47 is a new hand-held rock drill with the drilling speed and power of a 55-lb. drill and with easy holding qualities

comparable to the average 35-lb. drill. Design and construction are similar to the Sullivan L-57. The "dual-valve" construction gives complete control of admission and cut-off of air to either end of the piston independently. Wide open exhaust away from the operator, large oil reservoir, rubber cushioned, one-piece steel retainer, shake proof throttle valve handle and direct-to-steel airblast for adequate hole cleaning are advantages which assure high efficiency and operator comfort. Ask for Bull. 87-B.

K-81 Paving Breaker—incorporates "dual valve" construction (used in a paving breaker for the first time), which cushions the stroke at both ends of the piston and sparingly measures air for each forward stroke and fast

return stroke. The "dual valve" is end seating for long life and efficient action under any conditions. Ask for Bulletin 87-N.

WG-9 Compressor—The Sullivan "Industrial-Air" Compressor, Class WG-9 is designed for heavy-duty, 24-hour per day service in smaller industries or for specialized needs in larger plants.



It is a single stage, double acting, water-cooled vertical unit with exceptional capacity per square foot of floor area. Large smooth air passages throughout the unit assure unrestricted air flow from intake to discharge.

Ask for Bulletin A-43, Sullivan Machinery Co., Michigan City, Indiana.

Dig out the facts . . . why MICHIGAN Mobile Trench Hoes speed vital trench-digging jobs . . . why MICHIGAN speed, mobility, low maintenance costs pay dividends. Write for Bulletin E.

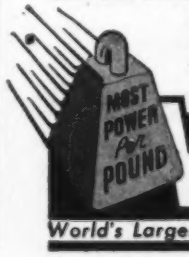
MICHIGAN
POWER SHOVEL COMPANY
BENTON HARBOR MICHIGAN

VALVE SEAT INSERTS
Can be taken for granted on ALL

WISCONSIN HEAVY-DUTY
Air-Cooled ENGINES

To provide the most satisfactory heavy-duty service and to reduce replacement costs to a minimum, ALL Wisconsin Engines are made with renewable valve seat inserts, made of costly chrome-nickel molybdenum alloy. You have less valve grinding to do, fewer tappet adjustments to make . . . and a simple replacement job.

Just one of many "better-than-average" details of Wisconsin Engine construction that help to maintain trouble-free service schedules for Wisconsin-powered equipment.



WISCONSIN MOTOR Corporation
MILWAUKEE, WISCONSIN, U. S. A.
World's Largest Builders of Heavy-Duty Air-Cooled Engines

CORONACH

"Of those immortal dead who live again
In minds made better by their presence."

EDWARD E. STALEY, 72, board chairman of The Baker Manufacturing Company, died Dec. 23 in Springfield, Ill., after an illness of several years. Before associating with Baker, Mr. Staley was active in the mercantile business and a pioneer figure in auto manufacture. He became secretary of Baker in 1917, president in 1919, and chairman in 1940, being succeeded as president by his son, W. C. Staley.

Edward E. Staley

Under the leadership of E. E. Staley, The Baker Manufacturing Company attained a prominent place among the manufacturers of bulldozers, construction equipment and snow plows.

▼

WILLIAM. G. IRWIN, nationally prominent industrialist, financier and philanthropist and one of the key figures in the development of this country's diesel engine industry, died in Indianapolis, at 77. Mr. Irwin's part in the development of the high speed diesel engine forms an interesting chapter in a remarkable and varied career.

William G. Irwin

During the last war, in 1918, Mr. Irwin had in his employ a chauffeur whose ambition it was to develop a high-speed diesel engine for trucks, buses, small boats and other small mobile equipment. Out of association with this young man, Clessie L. Cummins, grew the Cummins Engine Company, Columbus, Ohio, which Mr. Cummins today heads as president, Mr. Irwin having been board chairman until his death. Although preferring to remain in the background, Mr. Irwin, as board chairman, was continuously active in the company, constantly adding to its facilities. Mr. Irwin was also president of a large bank and starch manufacturing firm, and officer or director of a dozen enterprises including utilities, railroads, packing plants, insurance companies and textile mills.

▼

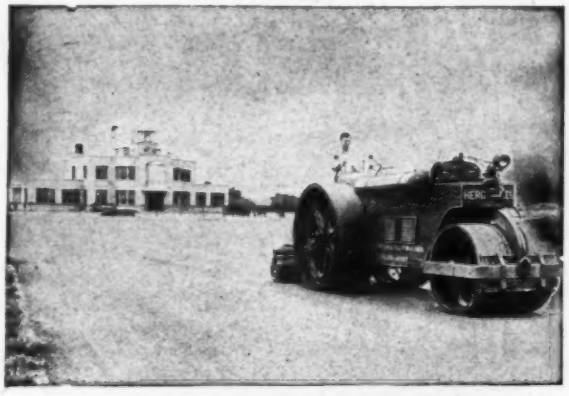
WALTER A. ROGERS, founder and chairman of Bates and Rogers Construction Corp., Chicago, died Jan 4 after a brief illness at age 76. An outstanding figure in construction circles for 43 years, Mr. Rogers through his firm built many large projects throughout the country. Among these were army cantonments, ordnance plants, dams, power plants, tunnels, bridges and railway improvements. During the past year the company held extensive bridge contracts on the Alaska Highway.

Mr. Rogers' broad interests were reflected in his trusteeship of George Williams College, and membership in other religious and educational organizations as well as in engineering society affairs.

▼

WILLIAM J. GALLAGHER, one of the best known road contractors in western New York, died Jan. 3 in Medina, N. Y., after a short illness. He entered the construction business in 1912. Since that time he has constructed over 300 miles of highway.

Your Hercules Roller



is Worthy of GOOD MAINTENANCE

Preventive maintenance, the checking for break-downs *before* they happen, is the best wartime "tonic" for your Hercules Ironeroller. Clean, lubricate, inspect and adjust regularly . . . make minor repairs *immediately* when needed. Good maintenance means continued "good rolling" . . . and to always be sure of a "good rolling" job, roll out the Hercules!

THE HERCULES COMPANY
Marion, Ohio

Modernize Old Asphalt Plants

by installing the

Fluidometer *Automatic* LIQUID METERING SYSTEM

★ ☆ ★

Saves Time and Material —Insures Accuracy and Uniformity—Adaptable to All Types of Plants.

● The FLUIDOMETER is a simple, dependable, completely non-manual metering system which eliminates false tare, human errors, injuries and occupational disease hazards incidental to the handling of hot bituminous cement. With a Fluidometer, a push button replaces the weighing bucket routine. When the button is pushed, the Fluidometer delivers the predetermined quantity, then automatically resets for the next delivery. Or it may be operated automatically by the time lock. Paving mixtures are held to precise limits of uniformity—time and operating costs are saved. Accuracy proved in years of service. Adaptable to all types of plants. Write for descriptive literature.

HETHERINGTON & BERNER INC., Indianapolis 7, Ind.

H&B Hetherington & Berner

With the Manufacturers

From Cedar Rapids comes an unusual story of patriotism. As a memorial to a fellow worker, Louis M. Parks, missing in action since January 28, 1943, the 1,000 men and women of the Iowa Manufacturing Company built on their own donated time a complete 25 cu. yd. rock crushing and screening plant and presented it to their government. The workers knew the daily capacity of the manufacturing concern to be one unit; so on Sunday, December 19, all were on hand to construct one additional plant as a 100% gift. At the end of eight hours the job was done.

D. A. Howard has been made president and general manager of the Huber Manufacturing Company, Marion, O., to fill vacancy left by death of E. J. Schroeter. Mr. Howard joined Huber in 1924 as treasurer, in 1929 was made secretary-treasurer and a director, and in January, 1943, became vice-president and general manager.

D. A. Howard

Marion Steam Shovel Company, Marion, Ohio, announces appointment of Walter N. Westland as Sales Manager.

Mr. Westland, an M.I.T. civil graduate, joined Marion in 1925, and has been New England district manager since 1932. Recently he also has conducted Washington contacts, where he worked closely with the various Government offices.

Walter N. Westland

15 Seconds to load or dump it.

Use 5 to 10 "bodies" to each unit.

with Brooks LOAD LUGGER mounted on the chassis

Road builders, construction engineers and contractors . . . you need this time-saving profit-making MATERIAL HANDLING UNIT on your 1944 jobs. Ideal for highway work, quarrying operations, snow removal, sewer laying and general hauling . . . wherever loading is done by hand labor.

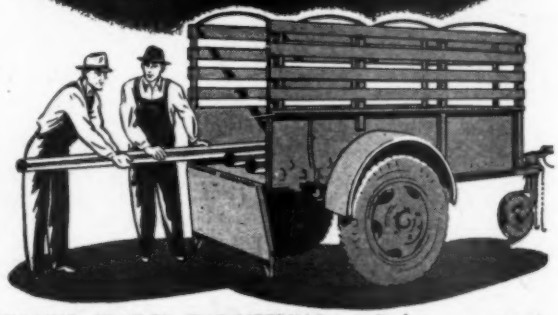
Write for Catalog No. 44

Distributors in all Principal Cities

501 Davenport Road

Brooks EQUIPMENT & MFG. CO. KNOXVILLE TENNESSEE

Trailerize your operations for Time and Labor Savings!



BEN-HUR TRAILER ENGINEERING applied to your post-war plans may show you many new uses for handy trailer units—to move tools to the job, to mount vital machine units, carry supplies and materials, or for mobile service units.

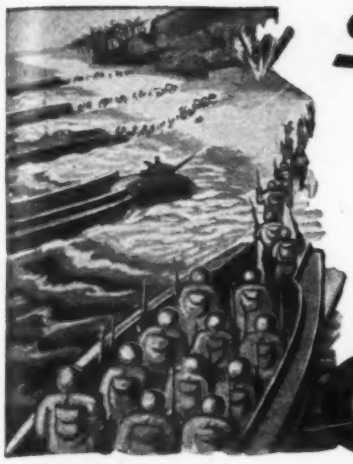
Take advantage of Ben-Hur's trailer designing experience. Write for our data sheet to aid your post-war planning.

ARMY E NAVY

BEN-HUR INDUSTRIAL TRAILERS

BEN-HUR MANUFACTURING CO.

434 East Keefe Avenue, Milwaukee 12, Wisconsin

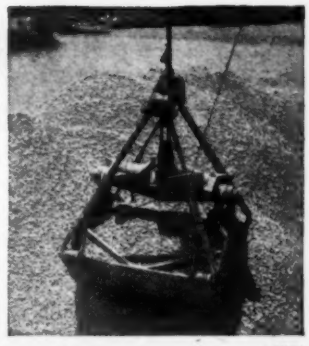


SPEEDY UNLOADING and REHANDLING

The world has been amazed at the unprecedented speed at which our troops are landed and casualties evacuated to hospitals.

Impressive too, is the remarkable speed with which Owen Buckets operate—taking capacity grabs of material quickly and discharging them speedily—handling great yardage at lowest cost.

THE OWEN BUCKET CO.
Breakwater Avenue Cleveland, Ohio
Branches: New York, Chicago, Philadelphia, Berkeley, Cal.



OWEN BUCKETS
A MOUTHFUL AT EVERY BITE

Stilley Now LeTourneau's Chief Field Engineer

Howard L. Stilley, veteran employee of R. G. LeTourneau, Inc., Peoria, Ill., has been promoted to chief field engineer. He succeeds Ken. F. Park, resigned to join the Caterpillar Tractor Co.

H. L. Stilley

Mr. Stilley, who studied at Chicago Technical College, joined LeTourneau in 1936 after spending six years with the Illinois State Highway Division. In 1937, when the LeTourneau field engineering department was organized with Mr. Park as chief, Mr. Stilley became his assistant. In February, 1940, Mr. Stilley was made assistant West Coast manager, district representative and field engineer for R. G. LeTourneau, Inc., with offices at the Stockton, Calif., headquarters of the earth moving machinery firm.

Mr. Stilley remained at Stockton until recently. He is already fulfilling his new duties in the Peoria LeTourneau headquarters.

▼

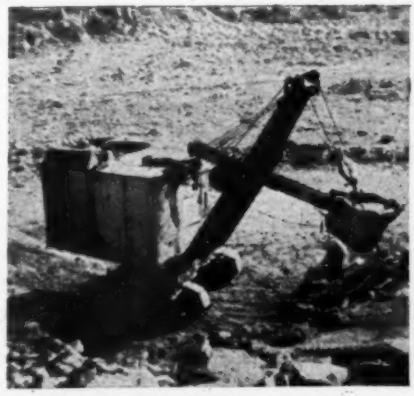
W. H. Hammond, vice president and director of branches, Gar Wood Industries, Inc., Detroit, has assigned Ross Miller to the hoist and body sales department for the duration, Mr. Miller becoming the new service manager and also is in charge of production scheduling of hoist and body service parts. W. H. Lingner is Mr. Miller's assistant.

▼

Paul C. Van Zandt, Consulting Engineer, has retired after 13 years with Universal Atlas Cement Company, United States Steel Corporation Subsidiary. He joined the Company in 1930 as Assistant to the President and subsequently became Vice President—Operating and Engineering—which position he held until September 3, 1942, when he became consulting engineer with headquarters at Chicago. For more than forty years Mr. Van Zandt has engaged in the design and installation of cement plant machinery in the United States, Canada, Mexico, Cuba, Japan and China. He was chairman of the Technical Coordinating Committee of the Portland Cement Association.

Seventeen years, millions of tons of material! A long sentence on anybody's rock pile, but its the history of "General Ironguts," first shovel ever built by The General Excavator Co., Marion, Ohio. This No. 1 General still is a long way from a "pension"; in fact, has stepped up its capacity, according to a General bulletin, averaged 300 tons daily at the Scioto Lime and Stone Co., Delaware, Ohio. Converted from a ½ yd. to ¾ yd., it recently sent out twenty 3½-ton truck loads in 65 minutes.

Anybody else a "case example" to beat this?



"Old Ironguts," the first shovel ever built by General Excavator Co.

on ROGERS TRAILERS

GETTING there "fustest with the mostest" as one early American General aptly phrased it, is battle strategy that really conquers!

In the lightning speed of mechanized warfare tanks ride "Pick-A-Back" to battle on ROGERS TRAILERS so their fighting capacity is unimpaired. Special ROGERS TRAILERS retreive disabled tanks so they can be repaired and rushed into battle again.

EXPERIENCE builds 'em
PERFORMANCE sells 'em

ROGERS TRAILERS are doing a real war job at home and abroad. New models which will be available to industry when war contracts are completed will be even better-engineered and more efficient than their predecessors.

ROGERS BROS. CORPORATION
ALBION, PENNA.

Costs Reduced

Sauerman Scraper hauls sand from hill to feed two asphalt mixing plants. One man runs the machine. Fuel cost is 40c per hour.

In about 100 working days, this 900-ft. span, 1½ cu. yd. Sauerman Slackline Cableway removed 40,000 tons of loose rock impeding a spillway and piled the spoil several hundred feet back from edge of stream.

dig, haul & dump

. . . . for a few cents per yard!

Where materials are to be moved distances of several hundred feet or more, a SAUERMAN Drag Scraper or Cableway can cut the cost per cubic yard to a low figure because it is able to dig, haul and place the material in a continuous, straightline operation, doing away with the expense of rehandling. The operation is smooth and rapid, producing large yardage with moderate expenditure of power.

The first cost of a SAUERMAN Machine is reasonable, maintenance amounts to very little, and the simplicity of operation makes it possible to place the control of even the largest installation in the hands of one operator. Moreover, the machine is very flexible, hence it is easy to adapt it to the exact needs of different jobs.

GET THIS USEFUL BOOKLET . . .

Typical examples of pit and bank excavation, reservoir cleaning, moving blasted ore, deep dredging, stockpiling and reclaiming, etc., are illustrated in the Sauerman catalog. A copy of this booklet is yours for the asking.

SAUERMAN BROS, Inc.

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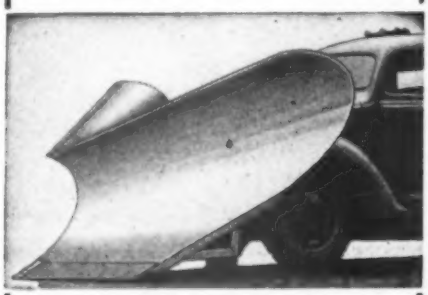
Root



Root V-type and Oneway Truck Snow Plows have helped to keep war industries, Army Camps and Airports open and will continue to do so.

Root has enlisted for the duration and is now running 100% for Victory.

ROOT SPRING SCRAPER CO.

Kalamazoo, Michigan

Builders of Truck Maintenance Equipment for more than 50 Yrs.

HOST TO MOST *Wartime* WHO VISIT BALTIMORE

Baltimore is knee-deep in war! Surrounded by war production industries . . . located near the Washington scene . . . Baltimore has become a focal point of wartime activities. This has created problems . . . problems that you can help to solve. Make your reservation in advance . . . cancel it promptly if you cannot use it . . . be patient if the service is not as smooth and speedy as in pre-war times. As Americans we are proud we have these problems . . as hotelmen we ask your indulgence.

700 rooms—each with radio, tub and shower.

THE LORD BALTIMORE HOTEL

BALTIMORE-1 ★ MARYLAND

Park Made Manager Sales Development Division of Caterpillar

Kenneth F. Park, Assoc. M. Am. Soc. C. E., has been appointed manager of the Sales Development Division of the Caterpillar Tractor Co. Mr. Park, a leading authority on earthmoving, has been associated with the heavy machinery business in the capacity of earthmover or equipment man since 1926.

Kenneth F. Park

In 1933 he joined the R. G. LeTourneau organization as advertising and sales promotion man- R. G. LeTourneau organization as advertising and sales promotion manager, also doing field engineering and photographic work, later becoming Chief Field Engineer, which position he held until his resignation. Most of his time was spent in the field, acting as consultant on engineering problems.

Mr. Park is an author of one of the Army manuals, "Principles of Modern Excavation and Equipment," as well as numerous other articles on construction and earth moving for trade journals. He has also done considerable lecture work for the U. S. Army instructing officers in current methods of earthmoving and construction. He also developed a pocket-size device for estimating earthmoving yardages, costs, times, and distances.

New GM Diesel Division

The plant at Grand Rapids, Mich., now operated by the Saginaw Steering Gear Division of General Motors, will be a permanent post-war industry. It will become an independent division of General Motors known as the Diesel Equipment Division. It will manufacture injectors for all General Motors Diesel engines. Manufacture of carbines, the present work of the Grand Rapids plant, will continue with injector manufacture until the carbine program is completed. C. F. Runchey, manager of the Grand Rapids plant, will become general manager of the new division. C. W. Truxwell, of the engineering staff of the Detroit Diesel Engine Division of General Motors at Detroit, will become chief engineer of the Diesel Equipment Division and will bring with him from Detroit a staff of technical and production men. Plans for the new division require post-war construction to meet special problems.

New Trade Literature

"HOW TO PUMP IT." A new catalog by this title has been issued on the Rex pump line. It gives complete facts on mechanical parts and construction of pumps, how they operate, what they will do, with specifications and capacity charts to aid in pump selection. Covers pumps ranging from 3,000 to 150,000 gal. per hour capacity. Write Chain Belt Company, 1600 West Spruce St., Milwaukee, Wis.

▼

"CONSTRUCTION OF CONCRETE PAVEMENT IN COLD WEATHER." Concrete Information Sheet HB-3, second edition, Portland Cement Association, this bulletin presents up-to-date recommendations on preparation of subgrade, treatment of frozen subgrade, concrete production, heating of materials, placement and after-protection of the slab; also specifications. Free on request to the Association, 33 West Grand Ave., Chicago, Ill.

▼

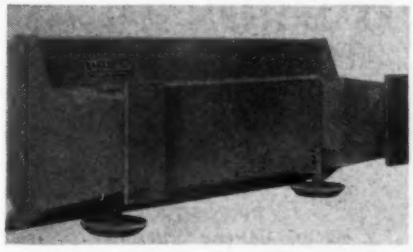
PORTABLE GAS - ELECTRIC SETS. A new 40-p. engineering manual on portable gas-electric generator plants has just been published by Master Vibrator Company, Dayton, Ohio. It includes simplified explanation of: power factor; load factor; mixed loads; power calculations and other vital data in language engineers and laymen alike can readily understand. Profusely illustrated, with photographs, drawings, diagrams and tables; catalog data on Master Vibrator equipment. Write Department of Information, Master Vibrator Company, Dayton 1, Ohio.

▼

"MANGANESE STEEL—TOUGHEST STEEL KNOWN" FOR THE CONSTRUCTION INDUSTRY." This 32-page booklet shows how and why manganese steel helps reduce construction costs, by cutting replacements of such items as chains, sheaves, wheels, shovel buckets, dipper teeth, crawlers, pump parts, and hundreds of other parts and units. Describe extensive research. Ask for bulletin 1143-CI, American Manganese Steel Division, American Brake Shoe Company, Chicago Heights, Ill.

NEW BAKER DOZER CATALOG. The Baker Manufacturing Company, Springfield, Ill., has recently published Condensed Catalog 839, showing its line of hydraulic bulldozers and gradebuilders as standardized on a wartime basis.

Baker hydraulic bulldozers, prior to the war, were available with two types of moldboards for each model of tractor—a boxed end moldboard for excavating work, and the regular high moldboard type for leveling, spreading, piling, back-filling and other earth-moving jobs. These two types have been combined in a single moldboard shown in accompanying illustration which combines all functions. A broader range of application is thus embodied in one unit.



"Wartime" moldboard for Baker Bulldozer, which combines straight and curved boxed and excavator moldboards

For SEAL COATING and ICE CONTROL with fewer men at less cost

The **FLINK** *Spreader*

The Flink self-feeding spreader is strictly a one-man outfit. Operated by driver of cab, who can throw spreader into action as he rapidly approaches, crosses and leaves intersection. Then it can be thrown out of action. Flink spreads forward or backward, full width of street, or less than half width. Handles sand, cinders, etc., up to 1" in size, wet or dry, spreading evenly up to 35' width. Does not limit use of truck for other purposes as Flink spreader fits on end as a tail gate. Positive agitation, no bridging. Flink spreader will pay for itself many times over the first year in labor saved, in extra yardage covered and reduction of complaints.

The **FLINK CO.,** STREATOR, ILLINOIS

For particulars write our nearest representative:

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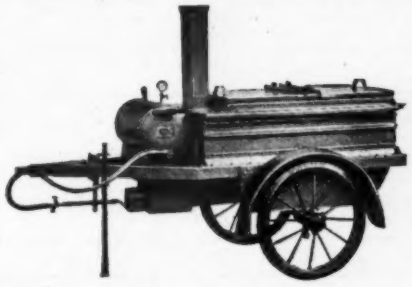
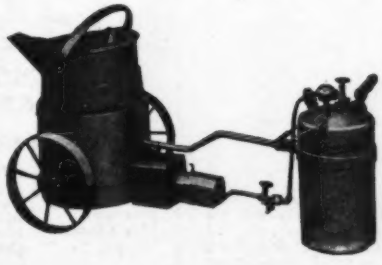
G. W. CLEMENTS, 3050 Freemont St., Columbus 4, Ohio
TULSA MACHINERY CO., Tulsa, Okla.
H. C. JORDAN, Irvington, Ky.
WISCONSIN OIL & EQUIPMENT CO., 34 Park Ave., Oshkosh, Wis.

CONNERY'S HEATING KETTLE

For speedy heating of tar and asphalt—



Use this CONNERY oil-burning Patrol Patching Heater on the *small* job and this CONNERY oil-burning kettle for *large-quantity* production.



Write for catalog showing our full line of tar and asphalt heating kettles, spraying attachments, pouring pots, etc.

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3900 North Second St. Philadelphia, Pa.

Clearing House

EXCEPTIONAL BARGAINS
IMMEDIATE SHIPMENT

FOR SALE:

44C Barber-Greene Ditcher.
10S Koehring Mixer on 2 Pneumatic Tires.
4" Rex Self Priming Pump—Gasoline Power.

FOR RENT:

522 Barber-Greene Pneumatic Tired Bucket Loader—Gasoline Power.

PAUL L. MATCHETTE COMPANY
Exclusive Distributors for Barber-Greene Co.
Missouri — Kansas — Oklahoma
20 West 9th Street, Kansas City, Mo.

EQUIPMENT WANTED

Equipment Wanted

3 yard Diesel Dragline 80 to 100' boom
2 yard Diesel shovel
½ yard shovel
Bulldozer
3—10 ton dump trucks
Box 51, Roads and Streets
330 South Wells Street, Chicago 6, Ill.

Equipment Wanted

All types contractors' equipment; especially 75-A and B Lorain shovels, ¾ yard draglines and shovels; 3 ton C H & E rollers; Euclid dump trucks; Caterpillar front end loaders and bulldozers. State age, condition, serial numbers, lowest cash price.
Charles M. Ingersoll Company
Tel. Edison 1010
19930 Detroit Road Rocky River, Ohio

Equipment Wanted

RD-7 or RD-8 Caterpillar tractor and bulldozer. State age, condition, price, etc.
Oak Construction Co.
220 E. 7th St. Royal Oak, Michigan

POSITION WANTED

Position Wanted

A young or energetic middle aged man experienced in Construction Machinery Sales, by a responsible Road Machinery Manufacturer. Must have ability to direct a sales force and handle distributors. If interested write Box 50, Roads & Streets, 330 South Wells St., Chicago 6, Illinois, giving qualifications, experience, references, age, draft status and compensation expected, in first response.

Position Wanted

Am open for a position as Supt. or Foreman. Have had 25 yrs. of experience as Foreman and Supt. on all classes of city and highway paving, sewers, levies, airports, dams. Can handle labor and modern eqquipment. Am past middle age, but capable of getting there. Will go anywhere. Dependable and sober. References.
Box 52, Roads & Streets
330 South Wells Street, Chicago 6, Ill.

Position Wanted — Superintendent. Have 35 years' experience supervising and building all phases of Federal, State, Cities and Counties Projects, Airports, Highways, Bridges, Viaducts, Interceptor Sewers, Water Lines, Foundations and Flood Walls, Heavy and Light. Excavating. Familiar with all Government Project Construction. Qualification Unquestionable. Organizer and Estimator. Knows Cost. Age 52 years. Best of References. Address Box No. 25, Roads and Streets, 330 So. Wells St., Chicago 6, Ill.

Position Wanted

Asphalt Paving Superintendent, 32 years' experience. Prefers middle west states territory. Box 60, Roads & Streets, 330 So. Wells St., Chicago 6, Ill.

Asphalt Salesman to represent a manufacturer of asphalts and road oils in middle west territory. 30 years' experience. Box 62, Roads and Streets, 330 So. Wells St., Chicago 6, Ill.

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In all sizes of tractor, truck, wheelbarrow, passenger, or 1800x24 tires.
An EQUA-FLEX "Sectional" repair constructed in your tire is guaranteed. Best results and prompt service!
We have pre-war quality used passenger, truck and some farm tractor tires.
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For Sale

50 Caterpillar Tractor with Hydraulic bulldozer
40 Diesel Caterpillar Tractor equipped with LeTourneau Angledozer
RD6 equipped with LeTourneau Angledozer
RD7 with double drum hoist
Cletrac FD 80 with Austin-Western 12 yd. Scraper
Model L Allis-Chalmers with 12 yd. Gar Wood Scraper
TD 18 International with Austin-Western 8 yd. Scraper
10-20 International with Trackson Front End Loader
Allis-Chalmers Model K Gar Wood Hydraulic Bulldozer
2 Austin-Western 77 Motor Patrols, 1 dual, 1 single tandem drive, hydraulic controls
1—Adams No. 511 Auto Patrols, Serial No. 130, tandem dual wheels, new rubber, 40x8 Diesel Engine, 60 HP, 14' Blade—Price: $4750.00
Allis-Chalmers Model 54 Motor Patrol
Jaeger Model 7S Mixer
P & H Model 150 ½ yd. Shovel, Serial No. 4668
52B Bucyrus-Erie Diesel 2½ yd. Dragline
75A 1¼ yd. Lorain Shovel
10B Bucyrus-Erie Combination
40 Lorain Diesel Shovel (1940)
Byers ½ yd. Shovel (1941)
Page-Walker Diesel 2½ yd. Dragline, 110' boom
P & H Model 755 Dragline, Diesel
¾ yd. Marion Electric Shovel
P & H 10-30 Ladder-type Trencher
Cleveland Pioneer and Baby Trencher
1 Complete Set of Electric Tunnel Equipment
Cedar Rapids Portable Crushing Plant, 9 x 36 crusher, 16 x 16 rolls, powered D 13,000 Diesel Caterpillar mounted on pneumatic tires
65-ton Locomotive
2 American Locomotives, 39 ton and 50 ton, side saddle boilers
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● Up to 2000 Tons a Day ●

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Centrifugal Air Separators

UNIVERSAL ROAD MACHINERY CO.
Kingston, N. Y.
Canadian Representatives: E. H. Hopkins & Co., Ltd. 340 Canada Cement Co., Montreal, Que., Can.

BAD GOING? *Here's the Truck that eats it up!*

If you need a truck for grading, hauling under the worst conditions, snow-removal or similar services you'll find nothing, anywhere, to equal a Marmon-Herrington *All-Wheel-Drive* converted Ford. Prices are surprisingly low, and operating costs a revelation in dollar-savings. Write for literature.

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"DUMMY JOINTS"

Add life to a concrete road by 'lessening' ruptures. They furnish means of expansion for the top portion of the paving. They should be installed at closer intervals transversely. Our installing devices make installation easy.

FLEXIBLE ROAD JOINT MACHINE CO.
WARREN, OHIO, U. S. A.

SILVER KING
HIGHWAY MOWER

• Watch out for those minor damages that might put your highway mower out of action for the duration. A little extra care prevents extra wear and repair!

If you own a Silver King, you'll see, more than ever, what it means to have a mowing unit ENGINEERED for the job. If you want replacement parts now to insure tip-top "good-as-new" performance *tomorrow*, write. We will be glad to serve you.

MANUFACTURED BY
THE FATE-ROOT-HEATH CO.
PLYMOUTH, OHIO

Hough Co. Folder

The Frank G. Hough Company, Libertyville, Illinois, has just issued a 4-page folder describing its Payloader (1 cu. yd.) Tractor Shovel—Model HL. This complete unit is designed for material handling or construction work at Airports, Army Camps, Ordnance Plants, Public Utilities, Municipalities, Highways and all commercial plants where bulk materials must be loaded, moved or handled on a production basis. Folder free on request.

Books and Pamphlets Received

"War Worker Transportation." By Theodore M. Matson, director, Bureau for Street and Traffic Research, Yale University. Report and analyzes the difficulties of the job and data on such topics as access roads, parking and terminal facilities, staggered hours, etc.

▼

"Planning Future Construction Markets" is the title of a booklet issued by the Associated General Contractors of America, Inc., Munsey Building, Washington, D. C. It consists of reprints of addresses and reports given at the AGC advisory and governing board meeting at Chicago last June.

▼

"1942 Annual Report" of the New Jersey highway department, Trenton.

▼

"The Speed Problem—A Library Research." Published by the Eno Foundation for Highway traffic control, Inc., Saugatuck, Conn.. 70 pages of analysis, tables, graphs and conclusions based on wide statistical study.

▼

"Wartime Road Problems, No. 7; Use of Soil-Cement Mixtures for Base Courses." Published October, 1943, by Highway Research Board, 2101 Constitution Ave., Washington, D. C.

▼

"Steel Products Manual," issued by American Iron and Steel Institute, 350 5th Ave., New York City. Covers packaging, marking and loading methods for steel products for overseas shipment.

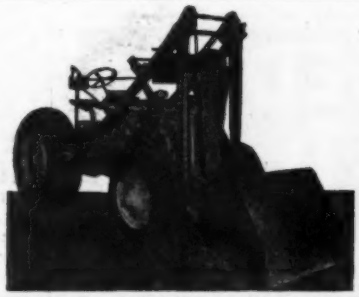
▼

"Public Control of Highway Access and Roadside Development." By David R. Levin, transportation economist, Public Roads Administration, Federal Works Agency. Price 15c. Superintendent of Documents, Washington, D. C.

▼

A. Leschen Appoints

R. P. Tyler has been appointed general sales manager and C. R. Dean assistant sales manager of A. Leschen & Sons Rope Company, St. Louis.



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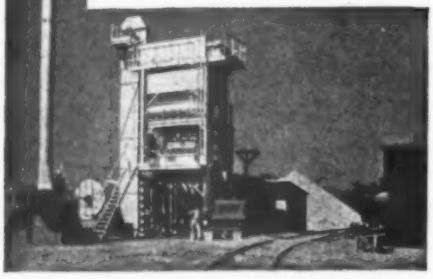
High Production—Low Cost

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NORRISTOWN, PENNA.

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La Crosse Makes Them Up To 200 Ton Capacity
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LA CROSSE WISCONSIN U.S.A.

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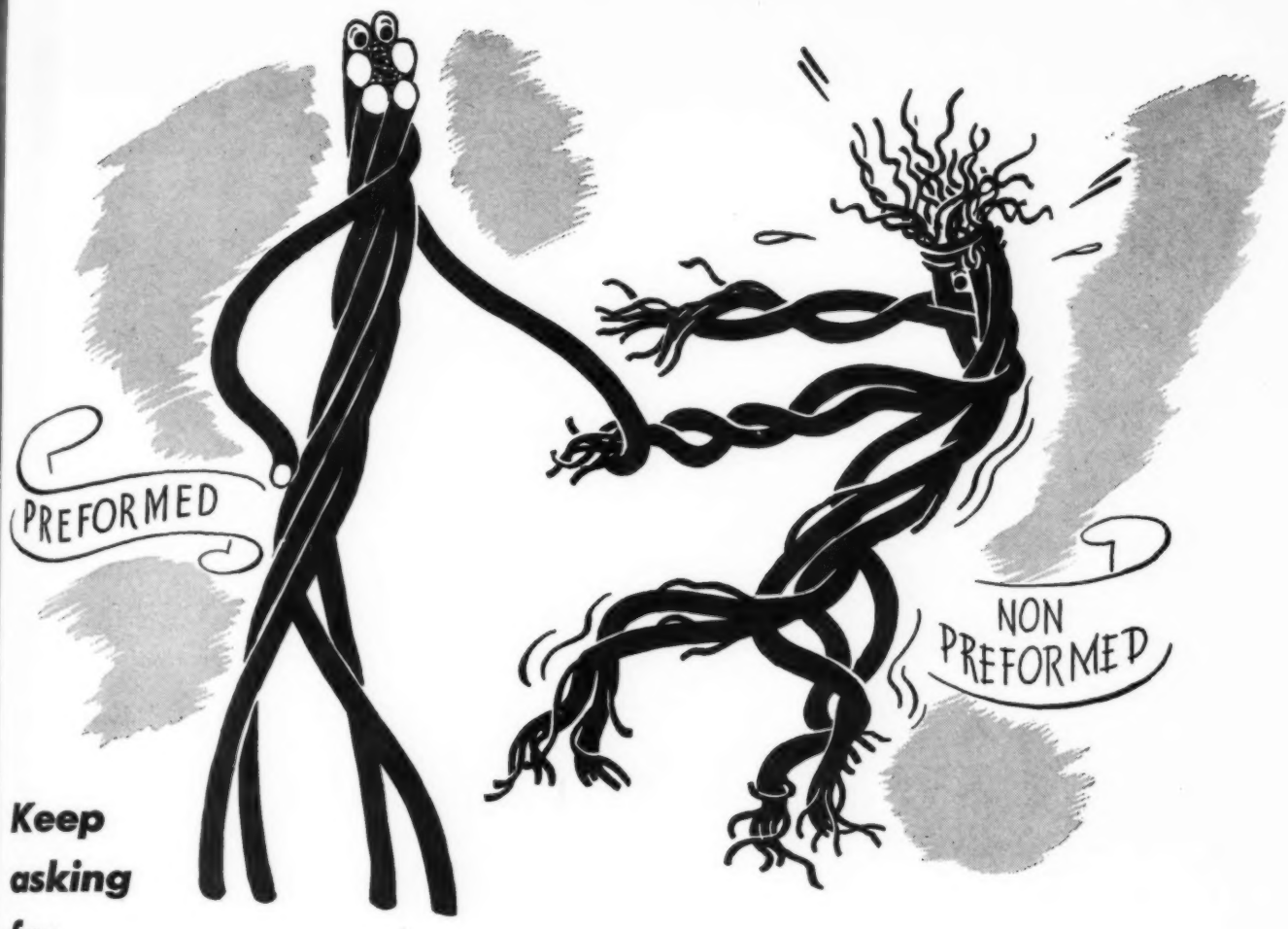

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